SCIENTIFIC AMERICAN

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Moki Snake Dance, Oraibi, 1898—Throwing the Snakes.

The Snake Men—Moki Snake Dance.

Antelope Priests in Line.

Snake Dance of Mokis—Carrying the Snakes in the Mouth.

Photographs copyrighted, 1898, by G. Wharton James.

Man Descending into Antelope Kiva at Walpi.

View of Walpi.

THE SNAKE DANCE OF THE MOKI INDIANS, ARIZONA.—II.—[See page 167.]

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GENEROUS CRITICISM—AND THE REVERSE.

Our readers will remember that an American firm not long ago received the contract for building and erecting the spans of the military railway bridge across the Atbara River in the Soudan, the contract being awarded to them entirely on the merits of their bid as compared with those of various English firms which were asked to compete. Not only was the American bid very much lower, but the firm undertook to do the work in a fraction of the time required by English builders.

The bridge was recently completed, and Lord Kitchener, the famous engineer-soldier of the Soudan, in speaking at the opening, complimented the builders on their work, which he said "may fairly well be considered a record achievement." He considered that they had shown "real grit" in their rapid erection of the bridge in the interior of Africa, "so far from home in the hottest months of the year and in dependence upon the labor of foreigners." Such commendation coming from a man who is not only a distinguished soldier but an experienced engineer, is significant.

In a recent issue of Engineering the editor reviews the history of the construction of the bridge, more particularly as it concerns the letting of the contract to an American firm, and concludes as follows: "The whole story of the Atbara bridge, relating to the foundations as well as to the superstructure, is full of interest and contains a moral which lies on the surface. The manufacturers of this country must either adopt new methods to cheapen production and increase the rapidity of the output, or they must be content to see orders given wholesale to foreign contractors with whom they cannot hope to compete. The feeble cry of favoritism, inferior material, inferior workmanship, etc., has been heard too long. Let us recognize frankly the danger that besets us and acknowledge the fact that in certain branches of industry we are commercially behind our most active competitors."

In marked contrast with these frank and manly acknowledgments of the skill and enterprise of American bridge builders is the tone adopted by one or two London journals, one of which says, "It now remains to be seen whether this bridge, built in America, on lines condemned by English engineers, will be able to stand the Atbara's rushing floods." As a matter of fact, "Atbara's rushing floods" will have no opportunity to test the stability of American workmanship, for the piers on which the American spans have just been swung are not of American construction, but were built by an Italian firm. The work of sinking the piers was done by this firm, for the reason that there was no English company in Egypt possessing the required plant for that class of work. If the piers should fail to hold up the superstructure, it will be no reflection upon the firm which built and put the latter in place.

The time was when English engineers believed themselves to be unsurpassable in their various lines of work, and it was the fashionable thing to speak lightly of American construction. For the great majority of Englishmen that day has passed, and the criticisms of such men as Lord Kitchener and the editor of Engineering may be taken as representative of the opinions of the English people as a whole.

ECONOMY OF THE ELECTRIC UNDERGROUND TROLLEY.

The annual report of the Metropolitan Street Railway Company, of New York city, which has just been filed at Albany, contains some figures on the cost of operation which afford further proof of the remarkable economy of the underground trolley as compared with the use of horse power. In spite of the fact that the company did not begin to feel the benefit of the change from horse power to electricity on the Sixth and Eighth Avenues and Twenty-third Street lines until last March, the report shows that the cost of operating the system was reduced last year to from 52·3 per cent to 48·75 per cent; and it is probable that the next annual report will show a still more marked reduction. These figures should be compared with those of the Manhattan Railway and of the Third Avenue cable system, the cable system costing 55·8 per cent of its receipts for operation, and the steam power lines of the Manhattan Railway costing 59 per cent.

It may be mentioned in this connection that the compressed air cars of the Metropolitan Company are now running on the cross-town lines, and, in view of the large amount of attention that has been drawn to the compressed air system during the past year, the comparison of the cost of operating these cars with the cost of the underground trolley cars would be of special interest. The compressed air system of car traction, as carried out by the Metropolitan Company, will form the subject of an illustrated article in an early issue of this journal.

IN SEARCH OF AN EFFECTIVE TROLLEY CAR BRAKE.

The fact that the New York State Railway Commission is now carrying out a series of tests to determine the best form of safety brake for use on trolley and cable cars in city streets cannot fail to give genuine satisfaction. We do not know of any subject coming within the sphere of their jurisdiction which could be of greater importance to the interest of street pedestrians in our traffic crowded cities.

Of late years there has been an enormous increase in the weight and speed of street cars, due chiefly to the introduction of cable and electrical systems. While nominal speeds of six or eight miles an hour may be imposed, it is patent to everyone that the actual running speed is frequently twice as great, and where the cars weigh from eight to ten or twelve tons, as they sometimes will, it is a physical impossibility for a brakeman to make an emergency stop with the hand brake, as ordinarily fitted.

The present tests are being carried out upon a section of the Lenox Avenue underground trolley line in this city. All of the manufacturers of safety brakes have been invited to compete, and, according to one of the commissioners, twenty-two different styles of brakes are to be tested. These will be of three kinds, according as they are operated by electricity, by compressed air, or by hand; and after the trials are over the commission will approve of one or possibly two of the brakes of each kind. On the first day's trials the test was made of an electric brake designed by the General Electric Company, the electric car used weighing about 11 tons. Over a dozen tests were made at speeds of from eight to eighteen miles an hour, and an automatic speed recorder was employed to determine the speed at the time the brake was applied and the time and distance required to stop the car. A full account of these trials will be given in a subsequent issue.

It was merely a question of time before this matter was taken up in serious earnestness. The loss of life and the injuries due to pedestrians being run down by trolley cars is simply shocking, and the more shocking because a greater part of it is absolutely preventable. While, of course, many of the accidents are chargeable to carelessness on the part of the motormen, the majority of them are doubtless due to the fact that the brakes are too feeble to bring the car to a sudden stop. We direct the attention of our readers to this subject as one in which there is a good field for further investigation.

FALL OF THE CHICAGO COLISEUM.

One of those accidents to framed steel buildings which are of all too frequent occurrence has recently taken place in Chicago, where the Coliseum, a structure 304 feet in length by 172 feet wide and 85 feet high, collapsed during erection. It seems that the work had proceeded as far as the erection of the large steel arches which carry the roof. Each arch was a three-hinged steel truss with a clear span of 150 feet, the highest point of the arch proper being 66½ feet from the ground. The arches footed on foundations of concrete which were themselves carried upon piling.

This accident, which involved the instant death of ten workmen and the injury of a large number of others, calls to mind a similar accident to the Coliseum which was being erected in Chicago in the year 1895, when the whole of the steel work collapsed. Another notable instance of this kind was the fall of the steel framework of the shed on the Wilson line pier of New York city. We discussed both these accidents at the time and pointed out, particularly in the case of the Wilson pier disaster, that the collapse was due to the lack of proper temporary bracing between the trusses during erection. It is claimed that more bracing would have been in place at the Coliseum on this occasion if the work had not been delayed by the prevalent scarcity of material; but in any case such huge arches as these at Chicago should never have been erected unless there was ample bracing at hand to give them a reasonable margin of stability. We again commend this most important question to the attention of firms who are engaged in the erection of framed steel structures, and suggest that it would be possible by a judicious use of temporary struts and ties to make absolute provision against collapse, without adding appreciably to the cost of erection.

THE PROLONGED DISTRESS IN PORTO RICO.

A recent dispatch from General Davis regarding the extent of the Porto Rico disaster proves that the worst fears have been more than realized and that for many months it will be necessary to send a steady supply of food to the sorely stricken island. The General repeats his request that supplies be sent at the rate of a thousand tons a week until further notice. He states the most pressing need is not for lumber for building, but for food, and he thinks that the aggregate cost of the supplies which will be necessary to carry the inhabitants over the intervening period until a new crop of fruits and vegetables has been grown will, perhaps, reach a total of $1,500,000. It seems that it is impossible to ship lumber from the coast to the interior, because of the complete wrecking of the inland roads; and the immediate efforts of the United States should, therefore, be directed to the mere question of keeping life in the bodies of the homeless people, who are already reconstructing the rough shelters which constitute the houses of the peasants in the interior. Another report states that the coffee and fruit crops as well as the small crops are entirely lost. The oranges and bananas were all thrown down, and a request is sent for the distribution of vegetable seeds of such kinds as may be easily and quickly raised.

It is gratifying to note that the response to the appeals which have been made have been instant and generous, and we are satisfied that the actual extent of the calamity has only to be made known to provoke the sending of all the needed supplies.

THE PRELIMINARY SPEED TRIAL OF THE "ALABAMA."

The Cramp Shipbuilding Company has made such good progress with the battleship "Alabama" that she has already been enabled to go out for her preliminary builders' trial, and the results are so satisfactory that it is reasonable to expect that this fine ship will exceed her contract speed of 16 knots by from a knot to a knot and a half when she comes to be officially tested for acceptance by the government.

Four runs were made over a measured distance of 11½ knots, and on the last attempt an average speed of 17·2 knots an hour was obtained for the whole course. The run immediately preceding this was made at the rate of 15·43 knots an hour, thus making an average speed for the two runs, under a forced draught, of 16·32 knots. The vessel was not down to her load line, but, on the other hand, her hull was foul as the result of more than twelve months spent in the waters of the Delaware River. A strong wind was blowing over the course, and this would account for the difference in the speeds of the last two runs, the first being made against, and the last with the wind. In the run out against the wind the average speed of revolution was 112, and in the run back 115. The builder, who was on board, expressed himself as greatly satisfied with the trial, and confident of exceeding the contract speed by a liberal margin.

VELOCITY OF THE WIND.

The great hurricane which wrought such destruction to Porto Rico has furnished remarkable records of velocity. Recent advices from the Weather Bureau station at Hatteras contain some very startling figures, and prove that if we are to register the highest possible velocities of the wind, our automatic apparatus will have to be strengthened accordingly. The greatest velocity occurred shortly after noon, the 17th of August, when records were made which prove this hurricane to have been the most severe within the past seventy-five years.

It seems on the morning of August 16, easterly gales were experienced at Hatteras in which the velocity of the wind ranged from thirty-six to fifty miles an hour. At four o'clock of the morning of the 17th the wind was blowing seventy miles an hour, and at one o'clock P. M. it was ninety-three miles an hour, with extreme velocities of from 120 to 140 miles an hour. At this time the anemometer cups were blown away; but the report states that the wind probably reached an even greater force from three P. M. to seven P. M. of that day. The highest velocity previously reported at the station was eighty miles an hour; this was in April, 1889. The air pressure reached 28·62 inches at eight P. M., and this is the lowest ever recorded on the middle Atlantic coast.

THE NEW PARCELS-POST TO GERMANY.

There was signed on August 26, by Postmaster-General Smith, for the United States, and Baron Mumm von Schwartzenstein, on behalf of Germany, the first parcels-post convention between this country and any of the European nations. We have had parcels-post conventions in existence for some little time between this land and several of the Latin-American republics and West Indian islands, but this is the first convention made on our behalf with any of the first-class powers. England, France, and some others of the powers have sought to effect such an agreement with us, or we have sought them; but thus far nothing definite has come of any of the overtures, save

those with Germany, and none are now under active consideration.

A prominent official of the Post Office Department had this to say, just after the new convention was signed: "One may safely predict that both the United States and Germany will profit alike under the new arrangement. Already with the West Indies and a few countries to the south of us the United States has a creditable parcels-post arrangement which compares favorably with that of England. When it comes, however, to dealing with Europe, the situation is reversed. We have a sample-post, but that is more tantalizing than useful in most cases. Articles can have no salable value, they must not exceed 8½ or, in some cases, 12 ounces in weight, or be more than 12 inches in length, 8 inches in breadth, and 4 inches in diameter; or, if rolled, be over 6 inches in diameter. Only one article of a kind may be sent, and articles for sale are transmitted only when fully prepaid at letter rates, a regulation practically prohibitive. In view of the wonderful growth of the foreign trade of the United States, the conclusion of the convention is to be welcomed as the first step of a system by which parcels can be transported between the United States and Europe, Asia, Africa, and Australia, at rates not outrageously disproportionate to the cost of heavy freightage, thereby opening an avenue for innumerable transactions and creating an intercommunication more important, as binding people together, than the mere extent of the parcels-traffic itself would indicate."

The new convention will go into effect on October 1 next, and by it any mailable package not exceeding eleven pounds in weight may be transmitted from one to the other country at the present merchandise rate. This rate is 12 cents per pound, or fraction thereof, on parcels going from this land to Germany, and at present 2 marks and 40 pfennig (57 cents), whatever its weight, in the other direction. It is expected that a rate of 1 mark and 60 pfennig (38 cents) will be adopted by Germany for all parcels under 1 kilogramme (2 pounds 3 ounces) in weight.

This postal departure, taken in connection with the forthcoming house-registry of letters by carriers, and the new and more complete money-order blanks, just adopted, whereby the sender is enabled to retain a numbered and signed receipt for his sending, gives to the country an earnest of the wide-awake management now at the head of that department. No branch of governmental service comes more closely in touch with our every-day life, and none has it in its power to do more to satisfy the people of the efficiency of an administration. No doubt, the convention just signed with Germany will be promptly followed by like agreements with all of the great powers.

SCIENTIFIC CONGRESS AT COLUMBUS.

BY DR. HORACE C. HOVEY.

An analysis of the registration list of the American Association for the Advancement of Science which recently met for a week at Columbus, O., shows that the 353 fellows and members enrolled came from thirty-three different States, besides delegates from Quebec and Montreal. Ohio furnished 113 names, New York 49, the District of Columbia 22, Massachusetts 15, Pennsylvania 21, Michigan 11, and other States from one to five each. The entire list was only one-third as large as that at the Boston meeting last year. But on the other hand more actual work was done, and less time given to social festivities. The attendance exceeded 33 of the 48 meetings held during the history of the association, and the results achieved were highly gratifying.

The entire number of lectures, addresses and scientific papers read and discussed more or less was 273. Chemistry led the van with 55 papers, next came Physics with 40, then Geology and Botany with 33 each, Anthropology with 27, Social and Economic Science with 20, Zoology with 19, Mathematics and Astronomy with 14, Mechanical Science and Engineering with 15, while the remainder were in general session, or shared with the affiliated societies. It should be stated, however, that these nine affiliated societies, meeting before and after the parent association, did a great amount of work by themselves of which no mention is now made in this communication. When it is taken into consideration that the above labor for science was done during what is regarded as "vacation," and at a season when the mercury daily stood above 90° in the shade, it must be acknowledged that scientists are men of zeal and industry.

Among addresses drawing the largest audiences were those bearing on military and naval science. Prof. William S. Aldrich, of the University of Illinois, and who temporarily resigned his place to enlist as an engineer during the war with Spain, described, by the aid of the lantern, "Some Engineering Experiences with Spanish Wrecks." He was an officer on board the repair ship "Vulcan," attached to the fleet of Admiral Sampson, off Santiago de Cuba. The work done was due to the far-sighted sagacity of the Engineer-in-Chief of the Navy, Rear-Admiral G. W. Melville, who fitted out the "Vulcan" with an equipment of tools, raw materials and appliances to do what ordinarily would have had to be done at a navy-yard. She carried lathes, planers, scrapers, bending-rolls, three brass furnaces, a five-ton foundry-cupola for smelting iron, and was able to make castings and do other foundry work in mid-ocean. Besides maintaining the efficiency of Admiral Sampson's fleet, the "Vulcan" fitted out and repaired the vessels of the Eastern squadron; repaired and fitted out the former Spanish gun-boat "Sandoval," which had been sunk by her captain and raised again by the United States steamer "Potomac." Still later the "Vulcan" overhauled in a similar manner the armored cruiser "Infanta Maria Teresa," that was floated by Hobson. This took five weeks. Then a crew of 44 men from the "Vulcan," with 77 Cuban helpers, volunteered to take the cruiser north under her own steam, convoyed by the "Vulcan" and wrecking tug "Merritt." A hurricane arising, the "Vulcan" spread 40 barrels of lard-oil on the waves, rescued the men, and then had to cut the "Teresa's" towline and let her drive on the coral shoals of Cat Island, at what was thought to be the spot where Columbus first set foot on this western hemisphere.

Prof. C. E. Munroe gave a stereopticon lecture, complimentary to the citizens of Columbus, on the "Application of Modern Explosives." After describing the manufacture of gun-cotton and fulminate of mercury, as carried on at the United States torpedo station, he said that the so-called smokeless powders were mixtures, but he had made a powder of a single substance that could be formed into suitable grains, namely, cellulose nitrite of the highest degree, pure as ivory, which would burn freely, but could not be detonated. This principle was adopted by the Russian government and our own navy and a factory established in 1892. Italy, Germany, France and England adopted smokeless powders, and it seems unpardonable that they should not have been made available for our own service when we were drawn into war with Spain. Among recently invented high explosives is "joveite," extensively tested at Indian Head. A shell loaded with joveite weighing 523 pounds was fired against a Harveyized-steel plate 14 5 inches thick of the United States steamer "Kentucky," and completely perforated the plate. Another penetrated 12 inches and burst, breaking the armor plate. No explosive effect has equaled this in intensity. Yet the government has not through responsible officials adopted a high explosive charge for its armor-piercing shells. For ten years Dr. Munroe has been urging the step. He also demonstrated that high explosives might be used in saving as well as in destroying life and property. He gave in closing a detailed description of the destruction of Flood Rock in the New York Harbor.

The section of Botany set aside an entire day to commemorate the life and services of the Columbus botanist, William Sullivant, whose portraits, sketches, and specimens were exhibited, and the results of whose labors were set forth in a series of interesting addresses. Members of his family, and also of the family of his brother, Mr. Joseph Sullivant, and of Leo Lesquereux, who were associated with him, were present. Among the speakers were Profs. Earle, Underwood, Barnes, Hallick, Best, Kellerman, and Mrs. Britton. The field in which Mr. Sullivant won special fame was with the mosses, twelve of which bear his name. Here he was undoubtedly the highest authority, and recognized as such at home and abroad. The exercises were in the Botanical Hall.

Useful and highly appropriate was Dr. Orton's address on the Geology of Columbus and Vicinity. He spoke of the glacial drifts and the source of their material. He showed that bowlder clay is largely derived from the comminution of black slate, the remnants of which appear in North Columbus. This unique theory was originated by Hon. J. H. Klippart. The bowlders that abound here have been traced to the rocks in place along the Northern lakes. Some of them are known to have come from Lake Ontario. Most surprising is the presence of masses of native copper, some of which are in the University Museum. He directed attention to beds of slate that had been pushed by the ice into folds and wrinkles like those found in the Allegheny Mountains. He described the limestones of the region, and the bone-beds whose contents have attracted so much attention. In connection with the several geological excursions Prof. Orton also gave useful charts and diagrams. Nearly every visitor inspected with delight and profit the objects displayed in the Orton Museum, particularly the Mastodon, Megalonyx and other gigantic creatures, which are not cast, but originals. There are huge logs from petrified forests, besides numerous small and beautiful specimens of fossil corals, trilobites, crinoids and shells.

We listened in vain for any discussion of "liquid air," a matter exciting such interest at the present time, and that certainly should have received a degree of attention, especially as notable progress has been claimed for its manufacture and use during the past year.

But the "kissing bug" was not forgotten, being ably treated by Dr. L. O. Howard, United States Entomologist, in a learned paper entitled "On Some Heteropterous Insects Formerly Responsible for Spider-bite Stories." He said that while, after several years of investigation, he had failed to verify by proof even a single case of serious or fatal spider-bite, he found that several bugs belonging to the Reduviidæ do inflict painful wounds. He described particularly the Reduvius personatus, an imported European species, the Melanolestes picipes and M. abdominalis, allied native species, and two varieties of Rahasus, and several kinds of Conorhinus, all of which occur in this country, and whose bites have often been attributed to spiders. He regarded the "kissing bug" craze as phenomenal, and largely due to stories told by the newspapers, based on a comparatively small number of actual cases. It reminded him of the tarantula frenzy that was once epidemic in Europe, with remarkable psychological manifestations, which had thus been reproduced this year in a mild form. Curious instances were told of nervous and even hysterical symptoms that had been produced by simple mosquito bites. The paper was accompanied by an exhibition of specimens and drawings.

SCIENCE NOTES.

Sir Edward Frankland, the distinguished English chemist, died in Norway on August 9.

According to The Chemical News, Prof. Dewar has succeeded in solidifying hydrogen into a glassy, transparent mass.

Among the great advantages which are claimed for American teas is their absence from sophistication and coloring matter. In the article which we published on the subject a few weeks ago, "dyeing tea" should have been "drying tea." There is no coloring material used at the Pinehurst establishment.

The results of a series of experiments made by German dairy experts show that milk that has been heated for fifteen minutes at 75° C. scarcely loses any of its capacity of being converted into cheese. An addition of calcium chloride shortens the time required by the rennet to coagulate the milk, the action of the salt being in proportion to the amount added.

The work upon the site of the so-called "Palace of Theodoric," at Ravenna, a most interesting building, has now been completed. It seems that the palace dates from an earlier period than that of the great Goth, and it was probably erected by the Exarchs during their residence at Ravenna, and there are signs of its having been used as a barracks for soldiers.

Prof. Cleveland Abbe, in his interesting address on "The Relations of Physics and Astronomy to the Mechanic Arts," and published in the current SUPPLEMENT, says that the demand for measurements of the highest attainable accuracy is characteristic of the study of astronomy and physics, and always keeps in excess of the art of construction. This is only one of the cases where science stimulates the mechanical arts.

The French have the exclusive right to carry on researches in Persia, but half of the finds are to belong to that country. Explorations are now being carried on at Susa, the old capital of the Chaldean kingdom. As the relics are dug up they are sent to Teheran, where they are divided. The Persian government does not care for such finds and sells its share to dealers. This results in the scattering of much valuable material.

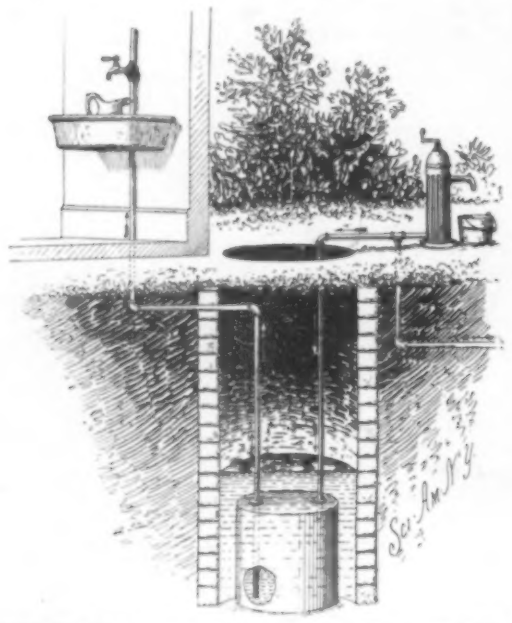
According to the Papier Zeitung, where it is desired to avoid black specks in paper made in the smoke-laden atmosphere of a manufacturing district, the only effective remedy is the filtration of the air through a woven fabric of fine texture. At Schering's works, in Berlin, where photographic sensitized paper and plates are made, a circulation of air is maintained by drawing in air through cloth filters and expelling the same through powerful ventilators in the roof.

At the present time Portugal with its few colonies and with its great load of debt is not a very important figure on the international stage, yet there was a time when it outranked all others as a commercial and colonizing power, and to that age belonged Vasco da Gama, and his quadracentenary was celebrated a few days ago. On August 29, 1499, he entered the harbor of Lisbon after having doubled the Cape of Good Hope and reaching Calicut on the Malabar coast of India. He was made Viceroy of India in 1524. His discoveries opened the way for the Portuguese empire in India and for other colonizers in the far East.

The International Physical Congress will be held at Paris, from the 6th to the 12th of August, 1900, under the patronage of the French government. It immediately precedes the International Electrical Congress. The subject of the papers, reports and discussions have not been definitely settled as yet. They will involve: 1. The definition and fixing of certain units (pressure, scale of hardness, quantity of heat, photometric magnitudes, constants of saccharimetry, scale of the spectrum, electric units not yet defined, etc.) 2. The bibliography of physics. 3. National laboratories. Visits to the Exposition, to laboratories and workshops and lectures on certain new subjects will also form a part of the programme of the Congress.

SIMPLE MEANS OF COOLING DRINKING WATER.

We have received from Mr. George H. Young, of Elmira, New York, a description of a simple means of cooling drinking water, which he has tested in an experimental plant at his residence. The plan answers both for summer and winter. Mr. Young's well is about sixteen feet deep and the water in the well is about three feet deep. A tank made of any suitable material is put in connection with the city main or the supply from a tank. The outlet pipe ends near the bottom of the tank, insuring the coldest part of the supply being delivered in the house. The device is simple and can be made by any plumber or steam



SIMPLE MEANS OF COOLING DRINKING WATER.

fitter. Often wells have been abandoned when the town or city has put in a system of water supply, and they can be utilized to cool the water from the mains. After wells have become somewhat contaminated, making the use of such water questionable from a sanitary point of view, they can be fitted with the device we have described with perfect safety, provided all the connections are tight. In winter the tank takes off the icy chill from the water, and in Mr. Young's plant the water is drawn at a temperature of about 50 degrees.

THE ACCURATE WEIGHING OF LOCOMOTIVES.

The accompanying illustration represents the method adopted by the Baldwin Locomotive Works for determining, with great exactness, the distribution of the weight of a locomotive among the different axles. The common practice in weighing a locomotive is to run it upon the scales and determine the total weight, then run only the driving wheels on the scales, taking the weight for them alone, and lastly to take the weight with the truck wheels only upon the scales. It was found, however, that if the second and third weighing are added together the total is always greater than the total weight as shown by the first weighing, which would indicate that some of the weight is counted twice over. The plan adopted by the Baldwin Locomotive Works is to place a separate scale beneath each pair of wheels, each scale having a resting place for each wheel of the axle and being itself mounted upon a little four-wheeled truck which runs upon a standard track rail. Each of the scales has a registering capacity of 60,000 pounds, which, of course, allows an ample margin over the heaviest concentration of load to be found in regular locomotive practice. Our illustration shows the weighing of a narrow-gage, double-ended locomotive built for a South American railroad.

The Origin of the Consul.

In the thirteenth century the English merchants had houses abroad, as for instance the "Domus Anglorum" at Bruges and the head of this house at one time was the celebrated William Caxton, who was responsible for the introduction of printing into England. The rector of this house was in fact a kind of consul. He sent home regular reports of the state of trade and prices and fluctuations of supply and demand, and this is perhaps the first example which we have of our modern consul obtaining industrial facts for the use of merchants at home.

The Value of Meat Extracts.

Dr. A. McGill, in a report to the Inland Revenue Department, Ottawa, Canada, observes that much has to be done by experimental physiologists before final pronouncements can be made upon the food value (if any) of the flesh bases which, in most instances, form the chief portion of the nitrogenous material in meat extracts. The bases certainly differ among themselves in food value, and, of course, if this is true of the flesh bases, it is à fortiori true of the various forms in which proteid matter occurs in these preparations, viz., as peptones, proteoses, acid albumens, and so forth.

Dr. McGill's experiments suggest that a part of the nitrogen in some meat preparations exist as urea. Urea certainly can have no food value, nor can one readily understand how the allegation that it is of use as a stimulant can be justified. Nature seems to have provided for its prompt elimination from the system, and it is certain that any failure to get rid of it by way of the kidneys resulted in serious disturbance of the vital functions, and may end in death by uræmia. No practical method has been discovered by which a sharp analytical line can be drawn between the nitrogen present as urea and that present as creatin, creatinin and xanthin.

It is evident that the flesh bases cannot be called food stuff in the proper sense of that term. They represent a stage of the process by which complex nitrogen compounds are changed to simple ones, supplying the energy so set free to the animal organism in the form of vital force. They may still have some food value, since they are not excreted as such, but undergo further simplification, till they appear as urea. It is certain that their food value is very much less than that of proteids proper. When once the urea stage is reached, the urea must be promptly got rid of.

The blood is the vehicle by which nutritive matter which has been digested and made soluble is conveyed to all parts of the body; and it is also the vehicle by which waste matter is conveyed to the lungs and other excretory organs to be got rid of. Flesh bases are always present in the blood, though in small amounts. They are much more largely present in muscle tissue, and when fresh lean beef is treated with hot water, these flesh bases are the chief material taken into solution. Apart from any possible nutritive value which they have, these flesh bases undoubtedly possess a stimulant action on the system, analogous to that exhibited by the alkaloids of tea, coffee, and cocoa, and it is beyond question that to this stimulating effect, rather than to any true nutritive power, they owe such value as they possess.—British Food Journal.

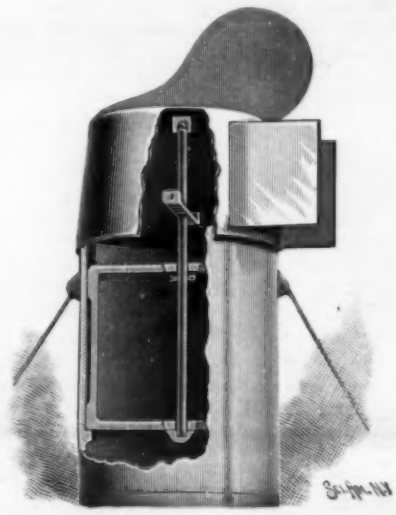
Theory of Welsbach Incandescent Mantle.

Nearly all mantles in use have practically the same composition—88 to 89 per cent oxide of thorium, 20 per cent oxide of cerium, and traces of other matter which only play a quite secondary part. The lighting power of mantles is not due to any special emissive power, as is proved by observing the emissivity of oxides of thorium, cerium, and magnesium, and of retort carbon heated in an electric furnace to a temperature of about 2,000°. The lighting power results simply from the high temperature to which the mantle is raised, and which is due (1) to the catalytic properties of oxide of cerium and (2) to the fine sub-division of the latter. The presence of oxide of cerium lowers the temperature of combustion of a mixture of oxygen and hydrogen from 650° to 350°; the combustion is consequently strongly active in the neighborhood of the mantle, and a large quantity of heat is disengaged. The oxide of thorium forms a porous mass consisting of a large number of very fine filaments, which are coated with oxide of cerium. On account of the bad conductivity of these fine filaments, the heat, instead of being rapidly dissipated in the mass, is concentrated on the filaments, and the mantle is raised, to a very high temperature. It is certain that the two oxides are both necessary to obtain a good result, for mantles of pure oxides of thorium or cerium give ten to twenty times less light.—Bunte (Paris Soc. Franc. Phys. Bull. 114, p. 2, 1898).

A SIMPLE CHIMNEY TOP AND COWL.

The annexed engraving represents an improved chimney top and cowl, in which the support for the rotary cowl is so secured in the top of a pipe or chimney that it may be readily removed and replaced without requiring the removal of any portion of the pipe or chimney.

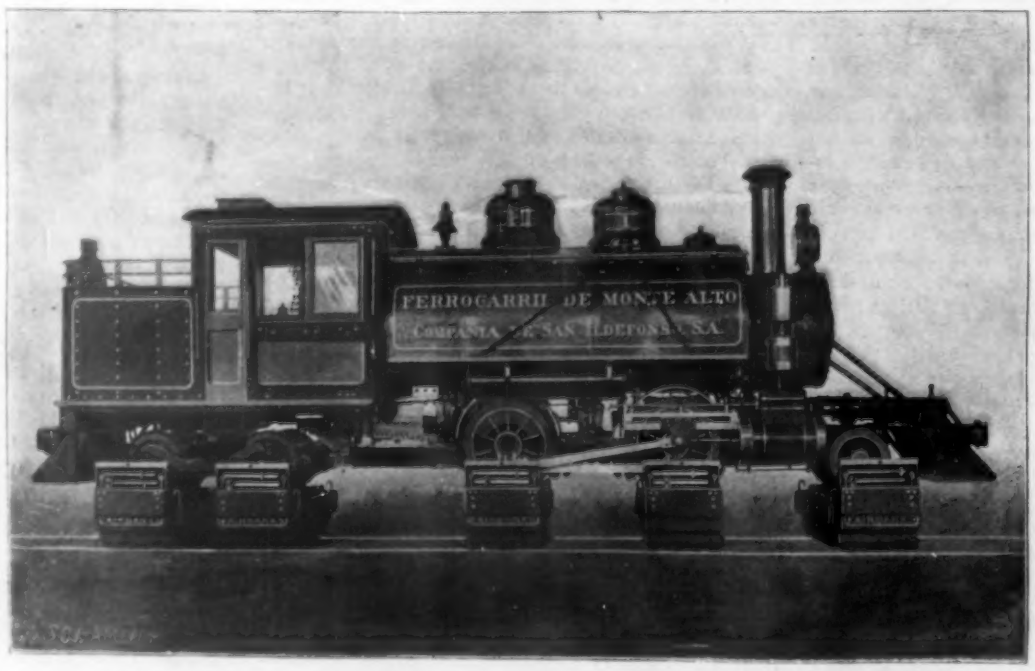
The chimney top or pipe is formed with two grooves on its interior surface, which are located diametrically opposite each other, and which are designed to receive the tongues of a sliding frame. A cowl spindle is passed through the sliding frame, its lower end being received by a socket. The cowl, which may be of the usual rotary form, has an interior cross-piece and a



SCHMALL'S CHIMNEY TOP AND COWL.

socket-piece on its upper end for the reception of the spindle. After having been placed in position, the cowl can be secured by means of a pin inserted through the spindle above the cross-piece. If necessary, the spindle may be locked in the sliding frame by inserting a pin beneath the top of the frame.

In assembling the parts, the spindle can be mounted either before or after the sliding frame has been placed in position. In the former case, the only operation required is the sliding of the frame into the grooves of the pipe chimney, and the locking of the cowl to the spindle. When it is desired to clean the chimney or pipe, it is necessary merely to lift up the sliding frame. The facility with which the cowl may be thus removed and replaced constitutes the chief merit of the invention. The patents on this cowl are controlled by Frank Schmall, 878 Eighth Avenue, New York city.



METHOD OF WEIGHING LOCOMOTIVES AT THE BALDWIN LOCOMOTIVE WORKS.

The Temperature of the Aged.

It seems to have been the general impression that the temperature of the blood became a little higher in advanced age than in the previous years of life, but Chelmonski (Deutsches Archiv für klinische Medicin, lxi., 1, 2; Deutsche Medizinal Zeitung, July 24) combats this view on the strength of thorough observations of over a hundred persons. Indeed, he finds that the temperature gradually tends to fall a little below what is considered the normal point. Moreover, the type of its diurnal cycle is reversed; it is higher in the morning than in the evening. There is something besides the figurative, then, in "hot blood of youth."—N. Y. Med. Jour.

A TIME-STAMP FOR MERCANTILE USE.

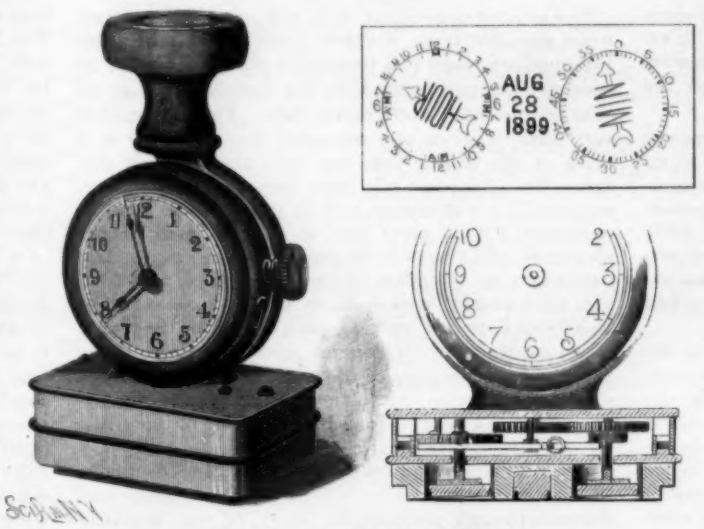
In many lines of business it is a matter of great importance to record the exact time of acts, operations or transactions, and to note upon papers and articles of various kinds the time of receipt or departure. A simple stamp by means of which such times can be recorded has been placed upon the market by Samuel H. Hoggson & Company, of 27 Thames Street, New York city, and possesses certain features of construction not uninteresting from a mechanical point of view.

The time-stamp comprises essentially a watch held in a body supported above a printing base. The printing base is provided with two recessed printing dials. Minute and hour shafts respectively extend within the recesses of the minute and hour dials and have printing hands normally resting above the dials. By means of gearing the minute and hour shafts are so connected with the watch mechanism that the minute and hour hands of the shafts are made to rotate in unison with the corresponding hands of the watch.

The body of the stamp, in which the watch is carried, is yieldingly supported above the printing base and is movable with the time-printing hands. The parts are so assembled that when the base carrying the dials is pressed against a piece of paper, the printing hands in the dial recesses can be forced into contact with the paper by depressing the body of the stamp. The time thus stamped upon the paper will coincide with the time indicated by the watch.

The hour dial, it will be observed, has two series of twelve graduations each. Owing to the arrangement of these graduations, it is unnecessary to provide any changing device to denote the "A. M.," "P. M.," and "M." divisions of the twenty-four hours, for it is immediately apparent that the upper half of the dial denotes day and the lower half night.

In operation the stamp is pressed upon an inked pad, then upon the article to be marked, a very slight pressure sufficing to insure a legible impression, giving year, month, day and minute, together with any wording desired around the dials. The stamp is only 4½ inches high, and weighs but 10 ounces.



HOGGSON POCKET TIME-STAMP.

A CONTRAST IN NOSES.

BY R. LYDEKKER.

Of all the features of the human countenance, none seems more prone to exhibit marked variations in size and shape than the nose. A broad and flattened nose is characteristic of negroes, whereas the classic or Grecian nose is found only among the Caucasian races of Europe. But while the nasal organs of the lower races of mankind differ in general from those of the higher peoples of Western Europe, yet it is among the latter that perhaps the greatest amount of variation in this repect may be noticed. And although even among these mixed Western nations a considerable amount of such nasal variability is evidently hereditary and distinctive of particular families or races, yet there are many instances in which it appears largely individual, although it may, of course, be due to reversion. Be this as it may, it will suffice for our present purpose to note that among European races a distinctly "snub-nosed," or "tip-tilted," type is not uncommon on the one extreme, while at the other we have what is commonly called the "long-nosed" type; the latter being broadly distinguished from the arched Roman, or aquiline, nose.

Now, it is a remarkable fact in natural history that whereas the great majority of the monkeys and apes of the Old World have noses of an ordinary pattern, that is to say, not very far removed from the type characterizing the inferior representatives of the human race, three of them have developed peculiarities in this respect which entitle them to be regarded as among the most extraordinary of all four-footed beasts. And not the least remarkable circumstance in connection with these nasal eccentricities is that the two extremes are found in members of a single group inhabiting widely distant and completely isolated areas.

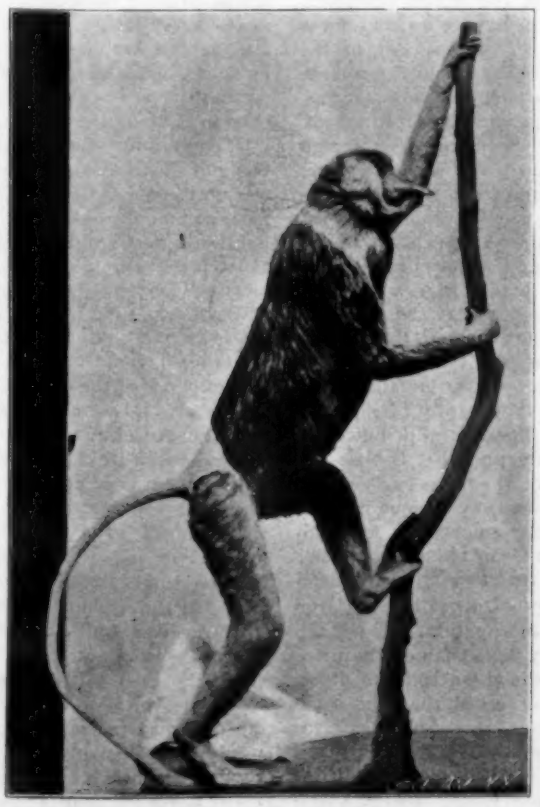
Before referring to the species displaying these remarkable peculiarities, it will be well to briefly refer to their nearest relatives. These are most familiarly known by the sacred Hanuman monkey, or Langur, of India, which is one of a large group of species inhabiting most of the Oriental countries; one kind, the Himalayan Langur, being found at a considerable elevation in the outer hills of the mighty range from which it takes its name. And in winter, or early spring, these large gray monkeys may frequently be seen disporting themselves among pines heavily laden with snow. As distinctive features of the Langurs, reference may be made to their slim build, long hind legs and tail, and the absence of pouches in the cheeks for the storage of food. Their hair is long and coarse, and may be of any color from slaty gray to bright foxy red or black. All have, for monkeys, fairly well-formed noses, of ordinary dimensions. Unlike the majority of the members of their order, they feed on leaves in preference to fruits; and, as showing how similarity of habit gives rise to similarity of structure (or, if the reader so pleases, vice versa), it is interesting to note that the Langurs have complex stomachs, strikingly similar to those of sheep and ruminants in general; most other monkeys having simple stomachs of the normal type.

As already mentioned, the three species of monkeys which have gone in for eccentric nasal development are near relatives of the Langurs. The first of these, which has been known in Europe since 1781, is an inhabitant of Borneo, where, be it observed, there are also true Langurs with normal noses. As may be seen from our figure (1), which represents a male in the Natural History Museum, the Proboscis monkey, as the species is called, is characterized by the inordinate length of the nasal organ of the adult male, which projects several inches in front of the line of the mouth, and gives to the whole physiognomy a most grotesque appearance. So remarkable, indeed, is the face of this monkey, that the first view of a stuffed specimen suggests to the beholder that it has been "faked," after the fashion of the "bogus" animals formerly manufactured by our Japanese friends. The nostrils are situated on the under surface of the tip of this ungainly proboscis, and are separated from one another by an extremely narrow partition. In the case of the female the degree of nasal development is considerably less; and in the young of both sexes the nose is comparatively short, with the nostrils visible from the front, instead of being directed downward. In point of size the Proboscis monkey is a comparatively large animal, the length of the head and body of the adult male being about thirty inches, and that of the tail some three inches less. Its color is likewise conspicuous and striking, the upper parts, with the exception of a light band across the loins, being brilliant chestnut, and the face, which is fringed with long yellowish hair, a reddish flesh color.

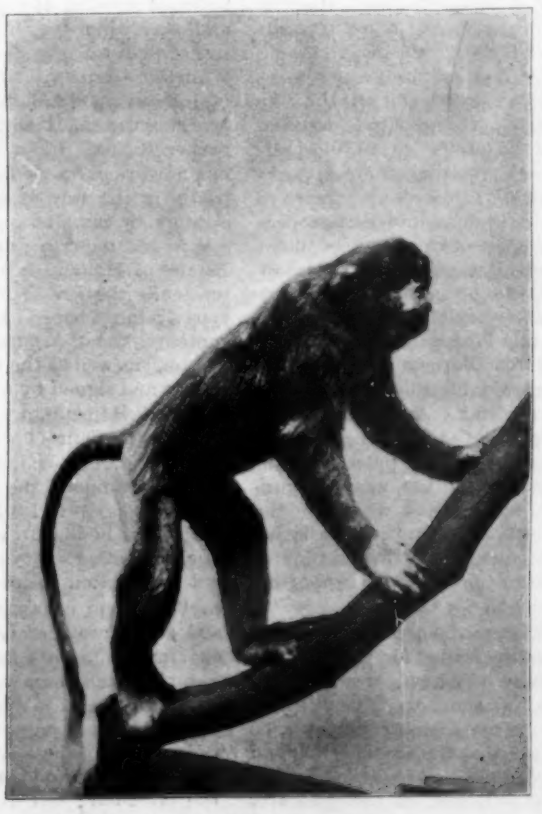
Far more brilliant in color is the first of the two Tibetan species which exhibit the opposite type of nasal eccentricity in the Langur group. But these snub-nosed monkeys, as they may be appropriately called, are fully as large as the Bornean species, and as they are of much stouter build, both as regards body and limbs, they look considerably bigger. Instead of a proboscis-like development of nose, these two very peculiar monkeys have their nasal organs bent suddenly upward at a sharp angle to the line of the face, so that the nostrils are fully visible from the front, the whole aspect of the face being curiously piquant. The species here figured—the orange snub-nosed monkey—was first made known to European science by the French missionary, Abbé David, who obtained specimens while traveling in the province of Moupin, in Eastern Tibet. Some of his specimens are preserved in the Zoological Museum at Paris, and the colored plate of a female has long been the only figure available to naturalists. Thanks, however, to an energetic English naturalist resident in China, the Natural History Museum has recently acquired a pair of these hitherto little known monkeys, our figure being taken from the male, which has been mounted for exhibition, and will form one of the most attractive specimens in the large monkey case. Since our photograph does not attempt chromatic effect, it is necessary to mention that the general color of the upper parts is rich olive brown, flecked with yellow, and suffused with rufous, while the sides of the face, the lower part of the forehead, and the under parts are brilliant yellowish orange, tending to full orange on the face, the naked portions of which are pale blue. Across the loins there is a light patch comparable to that of the Proboscis monkey, the tail being proportionately rather shorter than in the latter, with a distinct tendency toward a club shape. Altogether, the appearance of the animal is highly peculiar, both from the point of view of form and of coloration. The head, for example, in addition to its "tip-tilted" nose, is noticeable for its extreme massiveness, which gives an almost leonine appearance. And this general massiveness is equally observable in the limbs, which are relatively shorter than in the true Langurs, the feet being especially heavy and broad, with their toes almost concealed by long hair.

And here the attention of the reader may be directed to the circumstance that animals inhabiting cold countries (and Sze-chuan, where the British Museum specimens were obtained, can be very cold) are almost always much more heavily and substantially built than their relatives from warmer climes. An excellent instance of this phenomenon is afforded by the case of tigers in the same collection; the Bengal tiger being a long, lanky beast, while its cousin from Mongolia is a heavily built creature, with extraordinarily massive limbs.

Of course the longer hair of the Central Asiatic animal tends to exaggerate its general massiveness, which, however, would be perfectly apparent even without this extraneous aid. Possibly a stout and heavy build, especially as regards the limbs, may aid in pro-



I.—Proboscis Monkey.



II.—Snub-Nosed Monkey.

A CONTRAST IN NOSES.

tecting the circulatory system from the effects of extreme cold.

As regards the habits of the Orange snub-nosed monkey, our information is of the most meager description. These animals are stated, however, to congregate in troops of considerable size, and to ascend the tallest trees (the part of Tibet they inhabit being more or less wooded) in search of fruits, which they much prefer to leaves. When pressed by hunger, leaves and the tender shoots of bamboo are said to form their staple nutriment. Bearing in mind this alleged partiality for fruits, it would be most interesting to determine whether the stomach of these monkeys is as complex as that of the true Langurs.

In view of the recent acquisition by the British Museum of the first specimens of the Orange species of snub-nosed monkeys ever seen in the country, it is not a little curious that it was last year that the professors of the Paris Museum were enabled to publish, with excellent colored plates, the description of a new species of the same group, also coming from Tibet and the adjacent districts of Northwestern China.

This new species, which may be popularly known as the slaty snub-nosed monkey, is fully as large as its more brilliantly-colored relative, which it also resembles in the form of its nose. The tail is, however, much more bushy, and long-haired throughout. And while the color of the upper parts and outer and front surfaces of the limbs is dark slaty-brown, the cheeks, under parts, and thighs are mostly pure white; the naked portions of the face being flesh-colored.

The specimens of the slate-colored species in the Paris Museum were obtained in the northwest extremity of Yun-nan, on the left bank of the river Mekong, in the neighborhood of Yerkalo, and it seems evident that the species inhabits the crest of the long range separating the valley of the Mekong from that of the Yang-tse-kiang. During the summer it is probable that they frequent that side of the range which overlooks China, while their winter quarters would appear to be the side directed toward Tibet. The native name of Tehru-tehra, or snow-monkey, sufficiently indicates the severity of the climate of the region they inhabit. Probably the Blue River forms the line of division between the distributional areas of the slaty and the Orange species, the latter being found in Southern Kansu, Northern Sze-chuan, and Moupin.

Despite their long isolation from the sphere of European science, one, if not both, of these peculiar monkeys seems to have been known to the Chinese from time immemorial, for in a work entitled Shan-Hoi-King, or "Mountain and Sea Record," which has been supposed to date from more than two thousand years B. C., a so-called man of the Heu Yeung kingdom appears, from its tip-tilted nose, to be one or other of the species under consideration.

In the foregoing remarks we have treated the three species of monkeys with eccentric nasal development merely as zoological curiosities. But it will be evident to every thinking mind that there must be a reason for such strange departures from the normal, and until we discover such reason we cannot be said to know anything worth knowing about these animals. Unfortunately, those who have had the opportunity of seeing these monkeys in their native haunts have not assisted us in this matter; and as neither the Proboscis Monkey nor the Snub-nosed Monkeys have, we believe, hitherto been exhibited in confinement, there is an absolute lack of information in regard to this all-important point. And that the problem cannot be solved by guessing on the part of the stay-at-home naturalist may be regarded as practically certain. At the present day, owing partly to the anxiety to describe new species, and partly to the desire to obtain specimens of every animal for our museums, there appears a great tendency for intelligent explorers and travelers to degenerate from field naturalists into mere collectors. And the pity of this is too obvious to need more than mention. It is indeed often said that it is most important to obtain specimens of species before they become extinct; but the discovery of the raison d'être of the tip-tilted nose of the Tibetan monkeys, or of the proboscis-like organ of their Bornean cousin, would be a thousand times more valuable than the acquisition of untold specimens of either. And even the recently-acquired knowledge of the existence of the second species of Snub-nosed Monkey pales into unimportance when contrasted with the unsolved problem. By all means, then, let all those who have the opportunity put mere collecting into a very subsidiary place, and devote all their energies to the solution of problems of this nature (and their name is legion) before it becomes forever too late.

After what has been said as to the necessity of actual observation to determine the reason for the peculiar nasal development of these monkeys, it would obviously be out of place to attempt to solve the problem in any other way. Attention may, however, be directed to the circumstance that the Chiru, or Tibetan antelope, has a remarkably swollen and puffy nose. And although the Saiga antelope, of the plains of Central Russia, has an equally remarkable nasal development, yet it seems highly probable that in the case of the Chiru, at any rate, the enlarged size of the nasal chamber and nostrils is correlated with the rarefied atmosphere of the elevated plateau on which that ruminant dwells. The Snub-nosed Monkeys, although living at a considerably lower elevation than the Chiru, are yet "well up in the world"; and since the shape of the nose in the former would appear designed to admit the passage of as much air as possible with the least impossible impediment, the suggestion that the habitat has something to do with the nose-structure may perhaps be suggested. As to the reason for the genesis of the ungainly proboscis of the Bornean monkey, we have not even the rudiment of a theory to offer our readers.—We are indebted to Knowledge, of London, for the above interesting article.

The Ornamentation of Books.

The printed page—that is to say, the page printed from movable type, whether directly or through the intermediary stage of a stereotype plate—is almost of necessity less interesting than the manuscript page or that printed from an engraved plate. The difference is very obvious when one compares the title page of a book of the Elzevir folio size with the pages of the text. The title page will have been printed from an engraved plate of copper, and in it the letters will be composed with a great deal of care for each special character, and also with thought for the line, for the paragraph, for the effect of the whole page, an effect, not, as in modern bookwork, of conventional varying lengths of lines and varying sizes of letters, but with a serious thought for general decorative appearance of the whole. A page of the text will show, indeed, some attempt at design on the part of the typefounder; and herewith begins a brief inquiry into a small but most attractive detail.

The typefounders of Italy dropped at once the monkish character, the Gothic character, the angular and difficult though picturesque letter of the monastic scriptoria. They took the characters whose forms were furnished them by the Roman inscriptions; and as they had little archeological discrimination, they mingled together in an equal worship characters of the first and of the fourth centuries A.D. They adopted, however, from the medieval stock in trade some of those curious abbreviations which make the manuscript page of the fifteenth century a misery to unpracticed transcribers. In such a book as, for instance, the very beautiful book of 1483, "Roberti Voltury De Re Militari," almost any succeeding three or four lines will supply the curious student of letter form with from two to half a dozen picturesque abbreviations, varying from the simple scroll-shaped bar which, coming above a vowel, marks the suppression of a consonant, exactly as the modern French circumflex accent marks the place where of old an *s* had completed the word—from this to the capital *R* with a diagonal mark across it, to the *Q* with a mark across its tail and a double bar above it, to the *P* with its rounded top ending in a characteristic scroll, and to the double *p* of two kinds, the one looking like a Greek *φ*, all of which signify each its own special abbreviated syllable. To this must be added the attractive variety of the larger letters, for there are more shapes of the capital *T* and the capital *C* than one of each. This, however, is but a very moderate instance of variety in letter forms. Throughout the fifteenth and sixteenth centuries the habit of varying the shapes of the letters prevailed, and may often be thought to have grown in force rather than to have declined. A book as late as the "Ancient Germany" of Philip Cluvier (1631) is a mine of interesting detail to the student of letter forms. Ignoring the engraved title page, one finds in the book proper Roman, Italic and Greek characters mingled in a most remarkable fashion on every separate page, partly in the way of quotations from the numerous authors by compilation from whose works the book was pieced together; and then the Dedication to the Estates of Holland is in one and a very peculiar letter, while the Preface to the Reader is in a different type again. It need hardly be said that the tables of contents, the "Argumenta Rerum" and the "Index Rerum," as well as the Greek sonnet addressed to the author and signed by no less potent a name than that of Daniel Heinsius, are all in typography of separate and very artistic character. There is still, however, a modification to be insisted on, and that is that the differences among the forms of the same letter which we find to exist in Italian typography become here, in the Dutch book, extraordinarily numerous. A memorandum made many years ago seems to have been lost, but recollection seems to say that twenty forms of the capital *C* and nearly as many of other letters, large and small, are discoverable in the text. The Italic characters allow of this variety more than do the more formal Roman characters, but in these last the diversity exists. And it must be observed that the same page, the same paragraph, the same sentence, gives us instances of these differences. Thus, the long *ſ* and the long *s* are intended to be exactly alike except for the cross-bar; but the *s*'s are unlike among themselves, and so are the *ſ*s, and taking the two letters together, six varieties are discoverable in a sentence. The two letters *ſ i*, made in one piece, as they often are in modern times, exist in three varieties; the double *s*, made of two long *s*'s cast in one type; the *c t* in one piece; the capital *A* and the capital *M*, with long, sweeping, curved up-strokes at the beginning, and with a scroll at the top meant for ornament alone; the floriated and fantastic character *Æ*, of two forms; the *s t* in one piece—all these and more than these are to be found in one-quarter page, to which, moreover, the inserted quotations in Greek character of picturesque design add a further charm.

So much by way of episode. Good taste, or, at least, severe taste, would bid us go back to Italian models for all that is refined, and the act of opening the splendid volume of the Italian "Epistles of St. Jerome" (Ferrara, 1497) reminds the student that there is something else in the decoration of a page than merely beauty of typography and varieties of that beauty. The text is arranged in two columns to each page, with a broad, white band between, rivaling almost the width of the margin; and the column is broken continually by woodcuts as long from left to right as its own breadth. These woodcuts, concerning the authorship of which there has been some argument, are of beautiful design, in "outline," of course—that is to say, drawn in line and without more than indications of folds of drapery, subdivisions of flowing hair, or of beard, lines of rock and river, and the like—are yet in their small size and their simple composition of singular expressional and decorative value. Let it be admitted that such pictures as these were intended to be colored by hand; it must also be admitted that they were intended to be lovely when not so colored, and it must always have been the fate of five copies to remain uncolored for one that received its full adornment. Some of these cuts are of special application as titles or tail pieces, as when a youth, or angel, is seen supporting a scutcheon-shaped tablet bearing a text to which St. Jerome points—"Diapsalma" or "Nisi Dominus edificaverit domum." Whether used as head and tail pieces or not, these cuts are put in where they are wanted, and without the slightest attempt at pretty spacings in the page. This, it would seem, is a good hint for modern bookmakers. Besides the cuts of significant subject there are really splendid capital letters, white on a black ground diversified with white bands and scrolls. The lettering itself is of singular grace and dignity, though without that great variety of form which has been alluded to above. The life of St. Jerome, at the beginning of the volume, has many more cuts in proportion than the Epistles themselves; there are two pages framed with very splendid outline borders and two title pages of Gothic character, as if they had been designed a century before for a manuscript and were now copied in wood-engraving.

The well-known Italic letter seems to have been invented as a perpetuation of manuscript, because it is more natural to the human hand to write in sloping than in strictly vertical strokes, and any engrosser will tell you that he can turn out Italic letters more readily than imitations of Roman characters. It is a curious question whether, if we were accustomed to it, we could read it with perfect ease. It lingered on in Italy for a long time. The "Velmatius," printed in Venice in 1538, finds its forms repeated, or nearly so, in the hundred stories of "Sansovino," printed in 1571; nor is this a late specimen of carefully made books printed throughout in that character. Till a much later date, and elsewhere than in Italy, the Italian type was used for prefaces and notes, as in the book of Cluvier cited above; but the Roman character carried it over the Italian for the great body of a book even in Italy outside of Venice.

Of equal interest is the lingering desire to give something of the medieval picturesqueness to letters which are, on the whole, Roman in character. We find this more commonly outside of Italy than in the favored peninsula itself, and that is natural; but it is curious to see it prevailing in Spain, and to note such a book as the "Letters of St. Jerome," in Spanish, printed at Seville in 1532, and to see how the workman has steered a middle course between the strong pull which he received from Italy and the generally overmastering influence of the Church.

It seems best to insist upon these simple elements of design because the modern printed book might easily be made beautiful in the ways indicated, while it can only at great cost be adorned with splendid borders, beautiful sub-text designs or variety of color. It is the fault which the critics find with Morris's attempts at specially made alphabets and fonts of type, that he should not have given more variety to his letters. Thus, in the alphabet used in "The Floure and the Leafe," edited by F. S. Ellis, one is at a loss to know why there were not three forms of the capital *T* and six of the capital *W*, and as many of the lower case *f* or *p* or *y* instead of the single form of each which one discovers in examining a page. The charm which would have been given by that single modification of the typography would have been unspeakable; and many a reader who would not have discovered the cause would still have found the page more lovely.—Russell Sturgis in The Independent.

THE SNAKE DANCE OF THE MOKIS.—II.*

BY G. WHARTON JAMES.

At noon of the ninth day the ceremony of washing the snakes takes place in the snake kiva. This is a purely ceremonial observance. The priests have ceremonially washed themselves, but their snake brothers are unable to do this, hence they must have it done for them.

In the underground kiva, hewn out of the solid rock—a place some sixteen feet square—squat or sit the thirty-four or five priests. I was allowed to take my place right among them and to join in the singing. When all was ready the chief priest reverently uttered prayer, followed by another priest, who, after prayer, started the singing. Three or four of the older priests were seated around a large bowl full of water brought from some sacred spring many, many miles away. This water was blessed by smoking and breathing upon it and presenting it successively to the powers of the six world points, northwest, southeast, up and down.

At a given signal two men thrust their hands into the snake-containing ollas, and drew therefrom one or two writhing, wriggling reptiles. These they handed to the priests of the sacred water. All this time the singing, accompanied by the shaking of the rattles, continued. As the snakes were dipped again and again into the water, the force of the singing increased until it was a tornado of sound. Suddenly the priests who were washing the snakes withdrew them from the water and threw them over the heads of the sitting priests upon the sand of the sacred altar at the other end of the room. Simultaneously with the throwing half of the singing priests ceased their song and burst out into a blood-curdling yell, "Ow! Ow! Ow! Ow! Ow! Ow!"

Then, in a moment, all was quiet, more snakes were brought and washed, the singing and rattling beginning at a pianissimo and gradually increasing to a quadruple forte, when again the snakes were thrown upon the altar, with the shrieking voices yelling "Ow! Ow!" in a piercing falsetto, as before. The effect was simply horrifying. The dimly-lighted kiva, the solemn, monotonous hum of the priests, the splashing of the wriggling reptiles in the water, the serious and earnest countenances of the participants, the throwing of the snakes, and the wild shrieks fairly raised one's hair, made the heart stand still, stopped the action of the brain, sent cold chills down one's spinal column, and made goose-flesh of the whole of the surface of one's body.

And this continued until 50, 100, and even as high as 150 snakes were thus washed and thrown upon the altar. It was the duty of two men to keep the snakes upon the altar, but on a small area less than four feet square it can well be imagined the task was no easy or enviable one. Indeed, many of the snakes escaped and crawled over our feet and legs.

As soon as all the snakes were washed, all the priests retired except those whose duty it was to guard the snakes. Then it was that I dared to risk taking off the cap from my lens, pointing it at the almost quiescent mass of snakes, and trust to good luck for the result. Here is the fruition of my faith, in the first and only photograph ever made of the snakes of a Moki kiva after the ceremony of washing.

And now the sunset hour draws near. This is to witness the close of the nine days ceremony. It is to be public, for the snake dance itself is looked upon by all the people. Long before the hour the house tops are lined with Mokis, Navajos, Utes, Piutes, cowboys, miners, Mormons, preachers, scientists, and military men from Fort Wingate and other Western posts. Here is a distinguished German savant, and there a representative of the leading scientific society of France. Yonder is Dr. Jesse Walter Fewkes, the eminent specialist of the United States Bureau of Ethnology and the foremost authority of the world on the snake dance, while elbowing him and pumping him on every occasion is the inquisitive representative of one of America's leading journals.

See yonder group of interesting maidens; their hair is fixed up in the whirls on each side of the head that symbolize the squash blossom, the Hopi emblem of purity and maidenhood. Some of them are "Copper Cleopatras," indeed, and would be accounted good-looking anywhere. Here is a group of laughing, frolicking youngsters of both sexes, half of them stark naked, and, except for the dirt which freely allies itself to them, perfect little "fried cupids" as they have not inaptly been described. Now, working his way through the crowd comes a United States Congressman, and yonder is the president of a railroad. Perhaps one hundred and fifty outsiders saw the dance at Walpi two years ago.

Suddenly a murmur of approval goes up on every hand. The chief priest of the antelopes has come out of the kiva, and he is immediately followed by all the others; and, as soon as the line is formed, with reverent mien and stately step, they march to the dance plaza. Here has been erected a cotton-wood bower called the "kisi," in the base of which ollas have been placed containing the snakes. In front of this kisi is a hole covered by a plank. This hole represents the entrance to the underworld, and now the chief priest advances toward it, sprinkles a pinch of sacred meal over it, then vigorously stamps upon it, and marches on. The whole line do likewise. Four times the priests circle before the kisi, moving always from right to left, and stamping upon the meal-sprinkled board as they come to it. This is to awaken the attention of the gods of the underworld to the fact that the dance is about to begin.

Now the antelope priests line up either alongside or in front of the kisi—there being slight and unimportant variations in this and other regards at the different villages—all the while keeping up a solemn and monotonous humming song or prayer, while they await the coming of the snake priests.

At length, with stately stride and rapid movement, the snake men come, led by their chief. They go through the same ceremonies of sprinkling, stamping, and circling that the antelope priests did, and then line up, facing the kisi.

The two lines now for several minutes sing, rattle, sway their bodies to and fro and back and forth in a most impressive and interesting manner, until, at a given signal, the snake priests break up their line and divide into groups of three. The first group advances to the kisi. The first man of the group kneels down and receives from the warrior priest, who has entered the kisi, a writhing, wriggling, and, perhaps, dangerous reptile. Without a moment's hesitation the priest breathes upon it, puts it between his teeth, rises, and upon his companion's placing one arm around his shoulders, the two begin to amble and prance along, followed by the third member of their group, around the prescribed circuit. With a peculiar swaying of body, a rapid and jerky lifting high of one leg, then quickly dropping it and raising the other, the "carrier" and his "hugger" proceed about three-fourths of the circuit, when the carrier drops the snake from his mouth, and passes on to take his place to again visit the kisi, obtain another snake, and repeat the performance. But now comes in the duty of the "gatherer," the third man of the group. As soon as the snake falls to the ground, it naturally desires to escape. With a pinch of sacred meal in his fingers and his snake whip in his hand, the gatherer rapidly advances, scatters the meal over the snake, stoops, and like a flash has him in his hands. Sometimes, however, a vicious rattlesnake, resenting the rough treatment, coils ready to strike. Now watch the dexterous handling by a Moki of a venomous creature aroused to anger! With a "dab" of meal, the snake whip is brought into play, and the tickling feathers gently touch the angry reptile. As soon as he feels them, he uncoils and seeks to escape. Now is the time! Quicker than the eye can follow, the expert "gatherer" seizes the escaping creature, and that excitement is ended, only to allow the visitor to witness a similar scene going on elsewhere with other participants. In the meantime all the snake carriers have received their snakes and are perambulating around as did the first one, so that, until all the snakes are brought into use, it is an endless chain, composed of "carrier," snake, "hugger," and "gatherer." Now and again a snake glides away toward the group of spectators, and there is a frantic dash to get away. But the gatherers never fail to stop and capture their particular reptile. As the dance continues, the gatherers have more than their hands full, so, to ease themselves, they hand over their excited and wriggling victims to the antelope priests, who, during the whole of this part of the ceremony, remain in line, solemnly chanting.

At last all the snakes have been brought from the kisi. The chief priest steps forth, describes a circle of sacred meal upon the ground, and, at a given signal, all the priests, snake and antelope alike, rush up to it, and throw the snakes they have in hands or mouths into the circle, at the same time spitting upon them. The whole of the Hopi spectators, also, no matter where they may be, reverently spit toward this circle, where now one may see through the surrounding group of priests the writhing, wriggling, hissing, rattling mass of revolting reptiles. Never before on earth, except here, was such a hideous sight witnessed. But one's horror is kept in abeyance for awhile as is heard the prayer of the chief priest and we see him sprinkle the mass with sacred meal, while the asperger does the same thing from the sacred water bowl.

Then another signal is given! Curious spectator, carried away by your interest, beware! Look out! In a moment, the snake priests dart down, "grab" at the pile of intertwined snakes, get all they can in each hand, and then, regardless of your dread, thrust the snakes into the faces of all who stand in their way, and like pursued deer dart down the steep and precipitous trails into the appointed places of the valley beneath. Here let us watch them from the edge of the mesa. Reverently depositing them, they kneel and pray over them and then return to the mesa as hastily as they descended, divesting themselves of their dance paraphernalia as they return.

Now occurs one of the strangest portions of the whole ceremony. The antelope priests have already returned, with due decorum, to their kiva. One by one the snake men arrive at theirs, sweating and breathless from their run up the steep trails. When all have returned, they step to the top of their kiva, or, as at Walpi, to the western edge of the mesa, and there drink a large quantity of an emetic that has been especially prepared for the purpose. Then, O ye gods! gaze on if ye dare! The whole line of them may be seen bending over, solemnly and in most dignified manner, puking forth the horrible decoction they have just poured down. This is a ceremony of internal purification corresponding to the ceremonial washing of themselves and the snakes before described. This astounding spectacle ends as the priests disappear into their kiva, where they restore their stomachs to a more normal condition by feasting on the piki, pikami, and other delicacies the women now bring to them in great quantities. Then for two days frolic and feasting is indulged in, and the snake dance in that village at least is now over, to be repeated two years hence.

But the intelligent reader says: You have merely described the dance, and that is not all. What is behind the dance? A most reasonable question, and one that should be answered as far as possible.

What, then, is the significance, the real meaning of the snake dance? It is not, as is generally supposed, an act of snake worship. Here I can do no more than give the barest suggestion as to what modern science has concluded. It is mainly a prayer for rain in which acts of sun worship are introduced. The propitiation of the spider woman at her shrine by the offerings of prayers and bahos by the chief antelope priest demonstrate a desire for rain. She is asked to weave the clouds, for without them no rain can descend. The lightning symbol of the antelope priests; the shaking of their rattles, which sounds like the falling rain; the use of the whizzer to produce the sounds of the coming storm—these and other similar things show the intimate association of the dance with rain and its making.

Allied to rain are the fructifying processes of the earth; and as corn is their chief article of food, and its germination, growth, and maturity depend upon the rainfall, this has come to have an important place in the ceremony.

The use of the snakes is for a double purpose. In celebrating this ceremony it is the desire of the snake clan to reproduce the original conditions of its performance as near as possible, in order to gain all the efficacy they desire for their petitions. In this original performance the prayers of the snake mother were the potent ones. Hence the snakes must now be introduced to make potent prayers.

The other idea is that the snakes act as intermediaries to convey to the snake mother in the underworld the prayers for rain and corn growth that her children on the earth have uttered.

Other questions, also, naturally arise. Are the Mokis ever bitten by the venomous snakes, and, if so, what are the consequences? And what is the secret of their power in handling these dangerous reptiles with such startling freedom?

There are times when the priests are bitten, but, as was suggested in the snake legend, they have a snake venom charm liquid. This is prepared by the chief woman of the snake clan, and she and the snake priest are alone supposed to know the secret of its composition. It may be that ere long this secret will be given to the world by a gentleman who is largely in the confidence of the Hopi, but, as yet, it is practically unknown. That it is an antidote there can be no question. I have seen men seriously bitten by rattlesnakes, and in each case, after the use of the antidote, the wounded priests suffered but slightly.

As to the "why" of the handling of the snakes. The "fact" it is easy to state; but when one enters the realm of theory to explain the "why" of the fact, he places himself as a target for others to shoot at. My theory, however, based upon my own experience in the handling of these dangerous reptiles, is that a fear within yourself arouses a corresponding fear within the reptile. As soon as he feels fear he prepares to use the weapons of offense and defense with which nature has provided him.

If, on the other hand, you feel no fear, and, in touching the creature, do not hurt him so as to arouse his fear, he may be handled with impunity.

Be this as it may, the fact remains—for I have examined the snakes before, during, and after the ceremony—that dangerous and untampered with rattlesnakes are used by the Hopi in this, their prayer to "Those above" for rain.

* The reader is referred to the first article on the Snake Dance in the SCIENTIFIC AMERICAN for June 24, 1899, as some of the illustrations in that issue are mentioned in the present article.

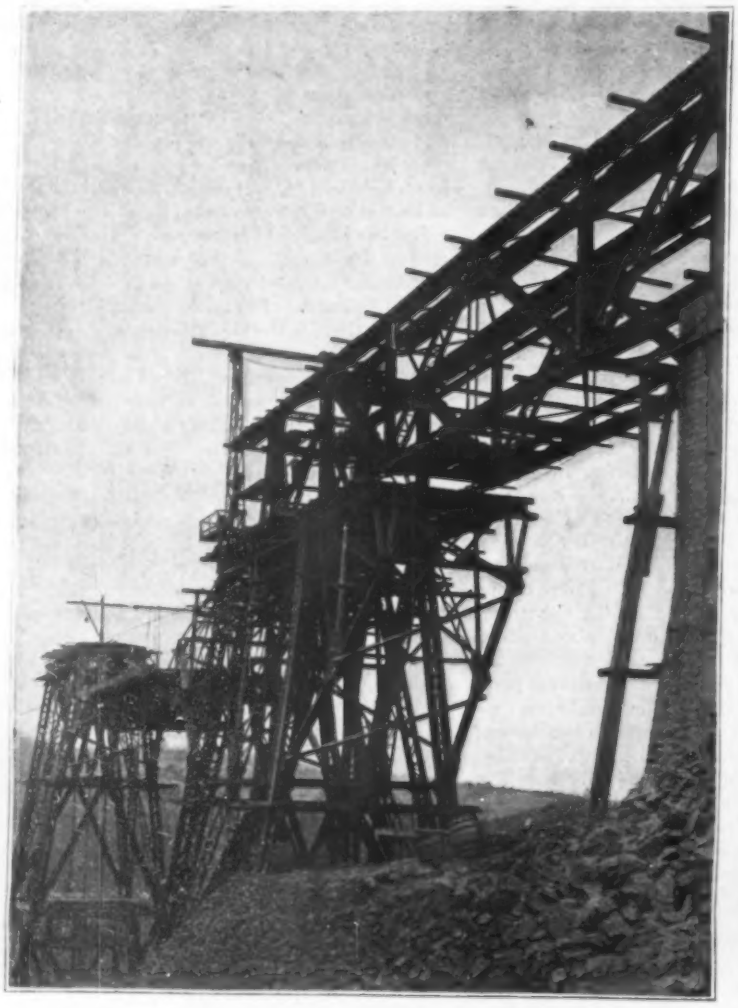
THE New York Zoological Society has secured from express companies a concession in rates on live animals, which is of great value to all zoological gardens and preserves throughout the United States. Formerly the cost of transporting live animals was very high, but the rate which has now been obtained will enable large quantities of them to be brought East at a minimum of expense.

THE MÜNGSTEN HIGH-LEVEL ARCH BRIDGE.

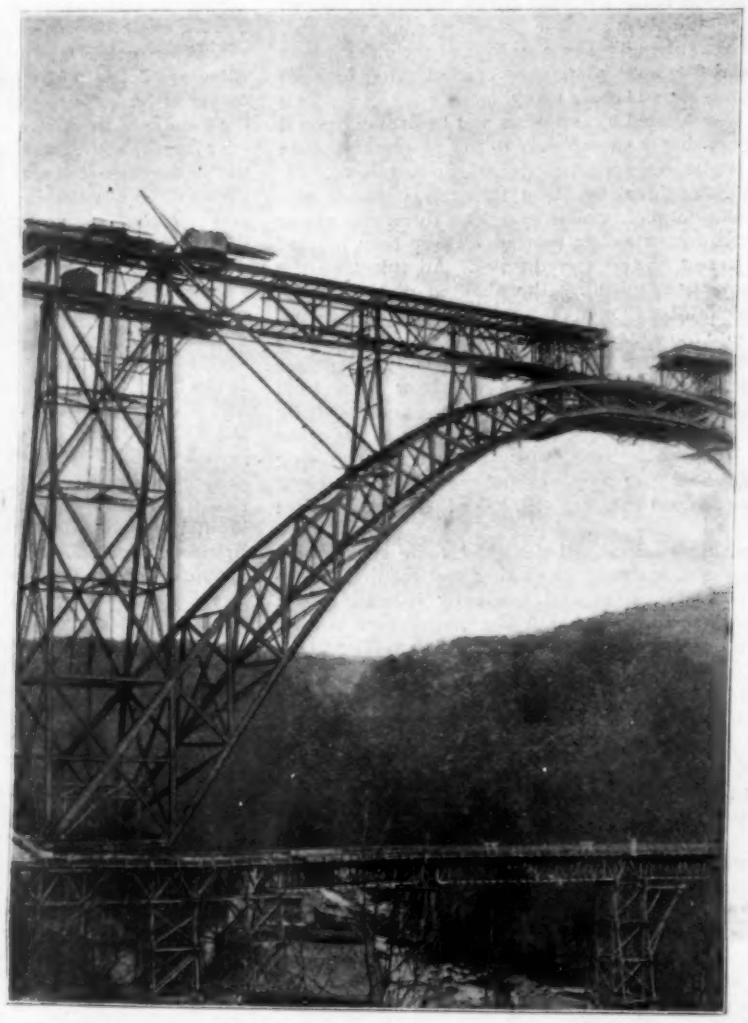
In the issue of the SCIENTIFIC AMERICAN of March 25, 1899, is an article on recent German arch bridges in which is given a comparative table of the largest bridges of this type throughout the world. Although the Müngsten bridge stands by no means near the head of the list in respect of the total length of the main span, it possesses certain features, such as its great height above the river, the unusual rise of the arch, the ingenious method of erection, and the extremely picturesque topography of the site, which render it second only to the great 840-foot arch bridge which has recently been opened across the gorge of the Niagara River. The Müngsten arch has a rise of about 225 feet, a span of 557·6 feet, and its floor is about 354 feet above the surface of the river Wupper, which flows beneath.

The bridge was built for the purpose of carrying the new railroad which has been constructed between the manufacturing towns of Solingen and Remscheid over the precipitous valley of the Wupper. Prior to the construction of the road, the distance between these two centers was about 28 miles, whereas the carriage of freight by the new road will only necessitate a haul of about one-fourth of that distance. The new railroad does not in itself present any constructive features of special interest; but the crossing of the valley of the Wupper involved the construction of a great viaduct, whose total length, including approaches, is 1,590 feet, and whose greatest height above the river is 354 feet. The plan adopted was selected from three different designs which were submitted to the government railway department. One of these proposed to span the valley with a bridge 1,630 feet long, which was to be carried on twelve skeleton towers, the four towers at the center of the bridge resting upon a trussed arch of 560 feet, which was to span the central portion of the valley. Another plan proposed a bridge 1,584 feet in length, which was to be carried upon nine braced towers of the type common in American railroad trestle work, with short inverted bowstring trusses between the piers. The third design was for a cantilever bridge with a central span of 560 feet and two shore spans of about 370 feet each, the total length from abutment to abutment of the cantilever being 1,530 feet. The first of these three designs was decided upon, to be built in the somewhat modified form presented in our illustrations.

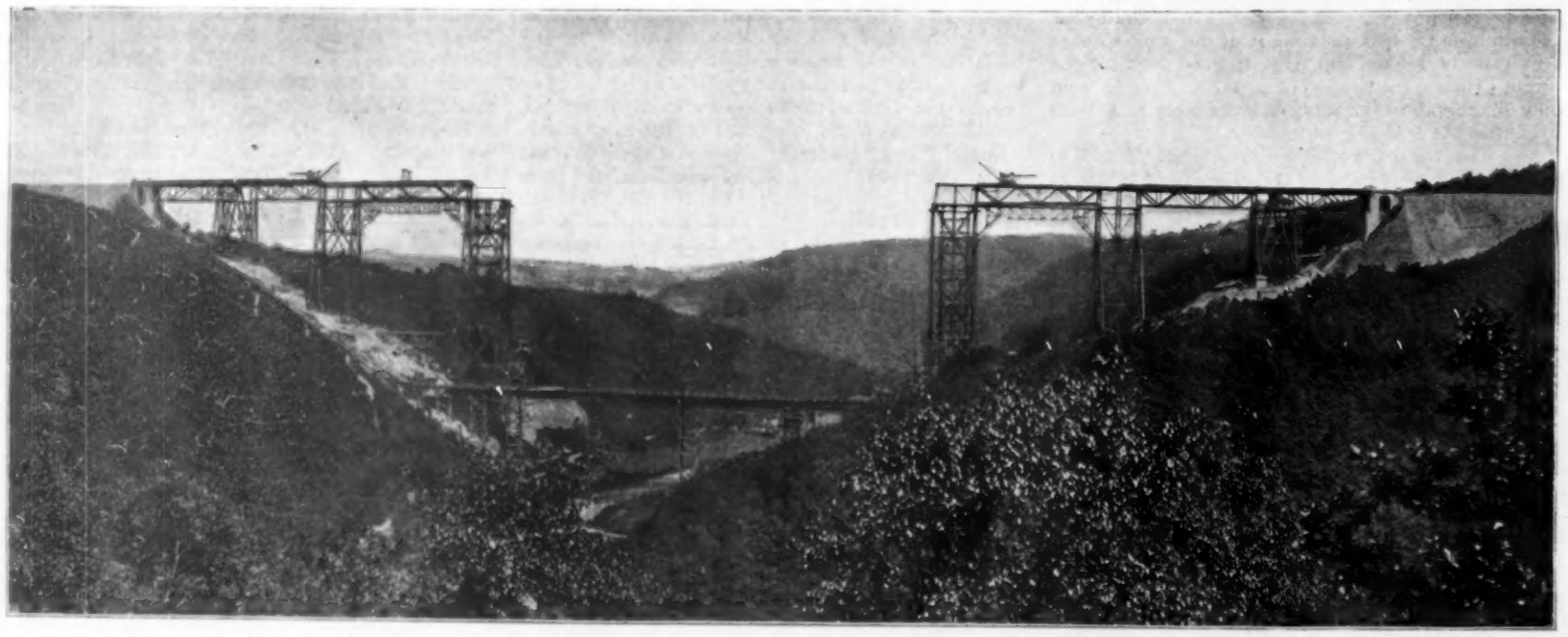
The floor of the viaduct, where it extends above the sloping sides of the valley, is carried upon a number of braced piers, while the central portion is carried across the Wupper by a central span of the braced arch type. The lengths of the various trussed spans of the superstructure are as follows: On the Remscheid end there is first one span of 100 feet and then two of 148 feet, while at the opposite end of the bridge, commencing from the abutment, there are two spans of 100 feet and one of 148 feet. The main portion of the superstructure above the central arch is carried at its center by the crown of the arch, and on either side of the crown it is carried upon two vertical bents which extend from the arch to the superstructure at a distance of 148 feet and 100 feet from the crown. The width of the floor of the bridge is 16½ feet, while a batter of one in seven is given to all the towers throughout the bridge. The piers are built in 40-foot panels, and the bracing, both for wind and static strains, is made particularly heavy. The two arched trusses are inclined inwardly and are arranged to lie in the same inclined plane as the towers of the bridge. At the crown the twin-arched trusses are the same distance apart as the width of roadway, that is to say, 16½ feet. They are parabolical in form, and the depth of the trusses between their upper and lower chords is about 13 feet at the crown and 39 feet at the springings. As will be seen from our illustrations, the alternate web members of the arch lie in a true vertical plane, with the result that they coincide with the vertical piers and supports and form with



1.—MÜNGSTEN BRIDGE—ERECTING THE STEEL-WORK OF THE APPROACH VIADUCT.



2.—MÜNGSTEN BRIDGE—ARCH COMPLETED AND FLOOR TRUSSES BEING BUILT OUT TO A CONNECTION.



3.—MUNGSTEN HIGH LEVEL BRIDGE, SHOWING CONSTRUCTION OF THE VIADUCT APPROACH TO THE CENTRAL ARCH. TEMPORARY ROADWAY BELOW.

them unbroken lines from the bottom chord of the trussed arch to the top chord of the superstructure trusses. The whole effect is harmonious and extremely pleasing.

A study of our illustrations, of one-half of the great central arch, shows that there is a line of wind bracing running through the lower chord of the arch and that sway bracing is introduced between each pair of vertical members throughout the whole arch. There is no lateral bracing, however, between the upper chords of the arch, the whole duty of resisting the wind strains being thrown upon the lower lateral system.

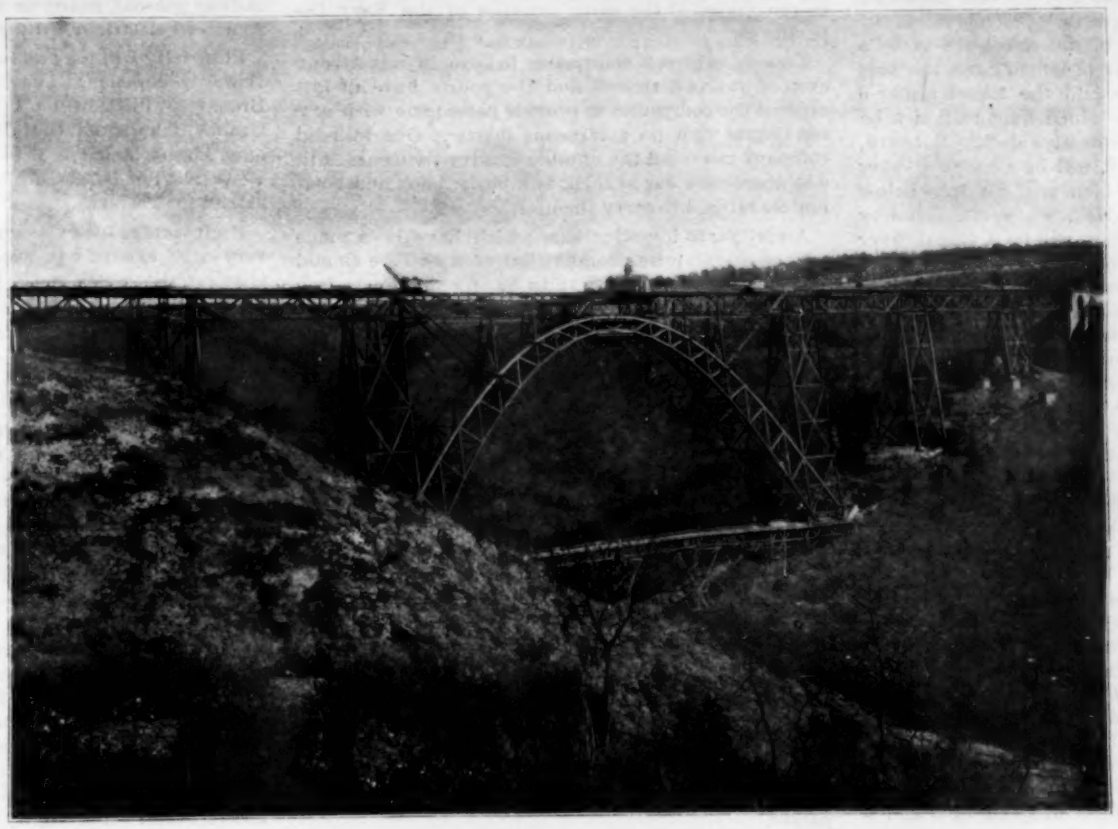
The superstructure trusses do not call for any special description. They are of the standard Warren type, with alternate struts and ties at each panel point. To provide for expansion and contraction, the superstructure trussing is divided at two points, which are located at the towers above the springing of the main arch.

The construction of this bridge, which was carried out under Mr. A. Rieppel as chief engineer, presented, on account of the great depth of the valley, considerable difficulty. A special plant operated by electric power was laid down at the site of the bridge, and extensive buildings, including residences for the workmen, were constructed. To begin with, a temporary inclined railway was built parallel to the line of the bridge down each slope of the valley, while a trestle bridge of timber was constructed to carry the railway over the river Wupper, the inclines being worked by separate electric winches. The portions of the bridge extending from the abutments to the springing piers at the main arch were erected first, the piers being built by the assistance of interior staging to their full height and the superstructure trusses erected on falsework and temporary trusses. After this portion of the bridge had been completed, temporary anchorage bolts were attached, which extended diagonally back from the first pier to an anchorage chamber which had been excavated from the solid rock of the hillside. These anchorages were put in to resist the horizontal pull due to the erection of the main arch by the overhang or cantilever principle. One of our illustrations shows this portion of the work completed prior to the building out of the main arch.

The great arched trusses and the superstructure trusses were built out, a panel at a time, without the use of any temporary falsework beneath, and as the overhang increased, the bending strain on the arch was relieved by tying the structure back to the piers. Two of these temporary ties are shown in our illustration, Fig. 2.

Unlike other great arch bridges, such as those at Niagara, Garabit, and Grunenthal, the Mungsten bridge is not provided with hinges at the skewbacks. While the absence of these hinges produces more complexity in the calculation of the stresses of the bridge, due to the reversal of strains, it provides a structure having greater rigidity and offering less difficulty in erection.

We are indebted for our illustrations and particulars to Fritz Müller von der Werra, civil engineer, of this city.



4.—THE MUNGSTEN BRIDGE.

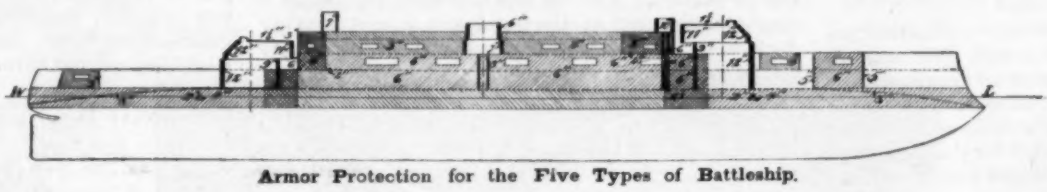
Total length, 1,500 feet; span of arch, 557·6 feet; depth from floor to river, 354 feet.

PROPOSED ARMAMENT FOR OUR THREE LATEST BATTLESHIPS.

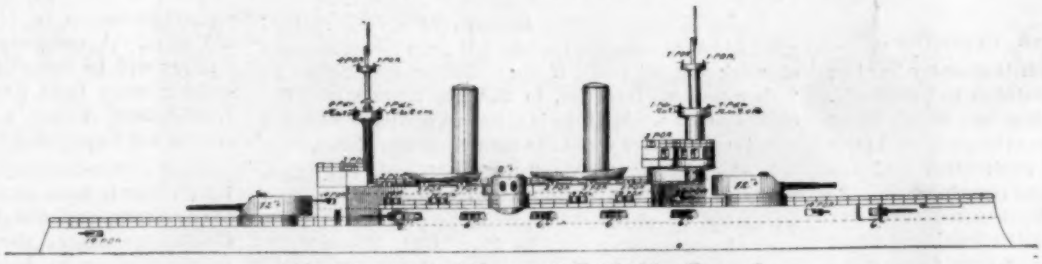
By the courtesy of Rear-Admiral O'Neil, Chief of the Naval Ordnance Bureau, we are enabled to reproduce the accompanying plans, which were submitted to the Bureau of Construction as suggestions in regard to the armament and armor of our three latest battleships, "New Jersey," "Georgia," and "Pennsylvania," authorized by the last Congress. They show the many improvements which are possible on a given displacement as the result of the greatly increased resisting power of the latest type of armor and also as the result of the increased energy due to longer guns and higher velocities.

Our Construction Bureau has never turned out a more creditable design than that for the "Alabama" class of battleships, and we notice that in the successive designs, first of the "Maine" and now of the "New Jersey" class, the Bureau has wisely maintained the general distinctive features of the "Alabama," and merely added such improvements as were possible owing to the general advance which has been made in guns, armor and motive power.

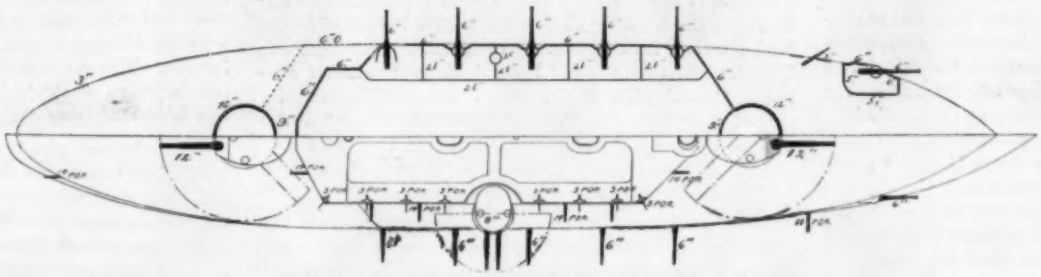
Rear-Admiral O'Neil has prepared five separate plans for the new ships. They all possess the highly meritorious and characteristic features of carrying extremely powerful batteries and being provided with a very complete system of protection. While all of the designs are creditable, we must confess that the first of them, known as type A, of which we present two different views, appeals to us as being decidedly the most efficient, and containing the best combination and proportion of the different types of guns. The five designs are identical in displacement, speed, and in the arrangement of the protective armor. Each plan, moreover, provides the same number of guns of each caliber and the same distribution in the secondary batteries, indeed the only modifications in the plans are those relating to the main battery in which are included the armor-piercing guns and the heavier rapid-fire weapons above 6 inches in caliber.



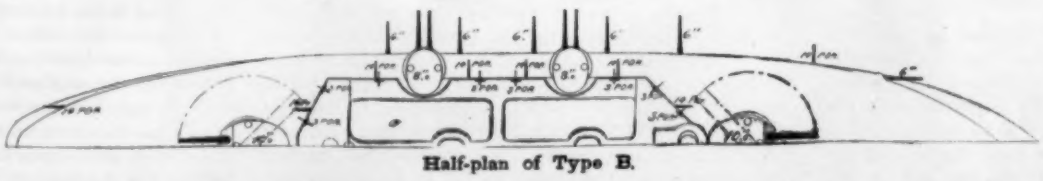
Armor Protection for the Five Types of Battleship.



Side Elevation of Proposed Battleship, Type A.



Half-plans of Upper and Main Decks, Type A.



Half-plan of Type B.

ALTERNATIVE PLANS FOR THE PROPOSED BATTLESHIPS OF THE "NEW JERSEY" CLASS.

The distribution of the armor is in every way admirable, and is far more complete than anything that has yet been attempted in any of the navies of the world. In the first place, there is a complete waterline belt 8 feet in depth, which extends from stem to stern. It is 9 inches thick at its upper edge and carries this thickness for a depth of 4½ feet, from which level it tapers gradually to 6 inches at the lower edge. This belt maintains these thicknesses over that portion of the ship extending between the 12-inch turrets, and at its extremities transverse bulkheads, 9 inches in thickness, extend diagonally inward to meet the barbette armor of the 12-inch guns. From abreast of these barbettes to the stem and stern the waterline armor is gradually reduced to 4 inches in thickness. From the top of the waterline belt to the level of the upper deck, and extending forward and aft, as shown on the plans, the sides are protected by 6-inch armor, at whose ends are diagonal walls 6 inches in thickness, the whole forming a complete central casemate or redoubt, within which are placed ten of the 6-inch rapid-fire guns. Every 6 inch gun is further protected on both sides by splinter bulkheads 2½ inches in thickness, and each of these separate casemates is closed at the rear by bulkheads of 2½-inch steel. The 6-inch guns in the bow of the vessel on the main deck are each protected by a complete casemate 6 inches in thickness on the outside, and with walls 5 inches thick in the interior of the ship. These casemates, like the main central casemate, extend from the protective deck clear to the upper deck. Above the central 6-inch gun redoubt there is another complete redoubt of 3-inch steel, within which is carried a battery of twelve 3-inch 14-pounder guns. There are also two 14-pounders on either bow on the main deck, just abaft of the 6-inch bow guns, while two others are placed on either quarter near the stern on the berth deck, all four of these guns being also protected by 3-inch armor.

The deck protection is also very complete. A protective deck, which is 2½ inches in

thickness on the flat and 3 inches in thickness on the slopes, extends throughout the vessel. The deck above the central casemate or redoubt, in which the 6-inch rapid-fire guns are located, is to be of 2-inch plates at the extremities of these casemates, as shown in the accompanying armor plan. The barbettes for the 12-inch guns will be 12 inches in thickness outside the diagonal armor and 9 inches in thickness on the inside, while the turrets are to have 12 inches of armor for the inclined port plates, the sides and the rear plates are to be 11 inches, and the top plates 1½ inches thick.

Amidships, on each side of the vessel, are to be a barbette and turret for a pair of 8-inch guns, the barbette armor to be 7 inches and the turret armor 6 inches in thickness, while a 3-inch ammunition tube will extend down to the protective deck. Forward, above the 14-pounder battery, will be a conning tower with 10-inch armor and a 6-inch armored tube below leading to the protective deck, while aft, standing above the 14-pounder redoubt, will be a signal tower protected with seven inches of steel.

The armament will be extremely powerful. The main battery will consist of four 12-inch guns, 40-caliber guns each of 58,221 foot tons energy, disposed in the two main turrets fore and aft; four 45-caliber 8-inch rifles, each of 13,602 foot tons energy, disposed in the two turrets amidships on either beam; and twelve 6-inch 50-caliber guns each of 5,838 foot tons energy, carried in the closed central casemate and the two bow casemates on the main deck. The secondary battery will consist of sixteen 3-inch 14-pounder guns, sixteen 3-pounders, sixteen 4-shot automatic pounders, six single-shot 1-pounders, ten machine guns, and two field pieces.

There is no ship afloat carrying a battery of such enormous energy as this, although by the time these three vessels are afloat—such is the rapidity of the development of naval armament—it is probable that they will be equaled, if not outmatched, by vessels already built or building in other parts of the world.

We welcome the return of the 8-inch gun. It proved itself to be the most efficient weapon used at Santiago and Manila, for although the hits were not as numerous as those made by the rapid-fire weapons of 6 and 5-inch caliber, the destructive effect was greater than that of any other type of gun carried in the war.

One of the plans herewith reproduced shows a modification in which there are eight in place of four 8-inch guns, arranged in four turrets, two on each beam. There are two other plans identical with this last except that one of them substitutes four 10-inch guns for the 12-inch, and the other substitutes two 10-inch and two 12-inch for the four 12-inch. In the second, third and fourth plans the fore and aft fire is the same as in the first plan, while the broadside fire is increased by two 8-inch guns. The fifth plan differs from all the others in having no 8-inch guns and in carrying sixteen instead of twelve 6-inch guns, eight of these firing on each broadside, four dead ahead and two dead astern. We think it is likely that the first of these designs will find most favor with our naval officers.

If, on a displacement of 13,509 tons, the Construction Bureau succeeds in building ships with this magnificent system of protection with such an unprecedented battery and with 18 knots speed, without reducing the necessary amount of stores, ammunition and berthing accommodation, it will produce by far the most effective battleship that the world has ever seen.

The Princeton Patagonian Expedition.

Prof. J. B. Hatcher of Princeton University has just returned from his geological expedition to Patagonia. After reaching the Straits of Magellan, Sandy Point was selected as the headquarters of the party and they then set out for the purpose of exploration and the collection of fossils, vertebrates and invertebrates. As no museum in the northern hemisphere contained any considerable collection of Patagonian fossils, no direct comparison of the northern and southern forms could be made. The primary object of Prof. Hatcher's expedition was to make the most extensive collections possible of fossils of Patagonia. He also devoted considerable attention to gathering ethnological, botanical and zoological specimens. The first Mesozoic mammals ever discovered were found in Patagonia on this expedition, and upward of thirty cases of Mezozoic vertebrates were shipped north. Naturally Prof. Hatcher gathered much valuable material illustrating the life and customs of the Patagonian Indian tribes, and he has obtained an important series of photographic negatives which depict the geological and physiographic features of that region.

ACCORDING to The Canadian Engineer, the last relic of the first epoch of railway engineering in Canada is passing away in the form of the tubular bridge which spans the Ottawa River, near its junction with the St. Lawrence, and a truss bridge is to be erected in its place. The old bridge is not only the last of the tubular bridges in Canada, but is also the last on this continent, so that its removal is really a historial event.

Engineering Notes.

An elevated railroad is to be constructed between Chattanooga and Lookout Mountain. The new line will be 2,300 feet long.

Liquid asphalt is being employed to sprinkle the highways of Kern County, Cal., near Bakersfield. The indications are that the experiment will be successful.

Two fine bronze breech-loading cannons captured from the Spanish at the battle of Manila Bay are to be remounted at the main entrance of the Navy Department.

French railroad companies believe in advertising even on railroad tickets, and the courts have at last ordered the companies to provide passengers with season tickets with no extraneous matter. One railroad company increased the number of advertisements until a season ticket was as thick as a pocketbook and commuters refused to carry them.

According to investigations which have been made on the spontaneous combustion of coal, care should be taken that the coal on ships be stored only on iron floors and it should be covered. The height of the heap should not exceed 7 or 8 feet, and steam pipes and flues should be at least 20 feet away. For sea voyages the coal should not be loaded earlier than one month after it is mined.

The effect of scraping a water main twenty-four inches in diameter is shown by the recent work of this kind done at Plymouth, England. According to The Engineering Record, a pipe scraper or "go-devil" was passed through the main and several tons of material were removed in this manner. The cleaning of the pipe resulted in an increase of its discharge from 2,000,000 to 3,000,000 gallons per day.

To prevent the formation of cracks in hardening steel the metal is coated with lime, and finally is heated to a cherry red heat, and is then immersed for some seconds in warm water, after which it is immediately plunged for about double the former period into a bath of rapeseed oil, and is finally transferred to a moderately cool bath of rock oil or water mixed with waste lime. This forms the subject of an English patent.

The Bureau of Construction of the Navy Department has ordered the work of outfitting the converted yachts "Wasp," "Frolic" and "Dorothea" to proceed at the Norfolk navy yard. The Bureau of Navigation believes that these small vessels can be advantageously used in coast survey work, which has heretofore been done by vessels of much larger type. The converted yachts "Eagle" and "Yankee" have been engaged in this work for some little time.

The old firm of R. Stephenson & Company have now joined the ranks of public liability companies. This is a historical factory, having been established in 1823 by George Stephenson, Edward Pease, of Darlington, and his relative Thomas Richardson, and Robert Stephenson. They built not only locomotives, but also marine engines. Now the new company has begun a shipbuilding yard at Hepburn, and a new graving dock is to be constructed, which will be the largest on the eastern coast of England.

In railway building in Soudan there are two harp players and a flute player to every gang of 40 or 50 men. As long as the music is brisk, the laborers do not seem to feel fatigued, and generally the musicians are the first to flag. It is a well known fact that even in our own country the foreman of a construction gang of negroes knows that he can get a larger amount of work out of them if they are kept singing. In Cuban tobacco factories, in the big room where the cigar makers work, there is always a reader who reads novels and papers while the men make the cigars.

In the reign of the English King Henry VII. (1485-1509), there existed a company of mariners who had authority by charter to prosecute persons who destroyed sea marks, etc. In May, 1514, Henry VIII. formed this company into a perpetual corporation by the style of the "Master Wardens and Assistants of the Guild of the Undivided Trinity, in the Parish of Deptford Strond, in the County of Kent." Although the functions of this society have been very much curtailed, the shipping world owes it a debt of gratitude, since it was the originator of the first attempt at the scientific illumination of dangerous spots on the coast. A further history of "Lighthouse Illumination" will be found in the current SUPPLEMENT.

In the new process of manufacturing sheet glass the plastic glass is rolled between metal plates and rollers covered with a soft permeable material, such as paper, wood pulp, asbestos or cellulose. It is said by means of this process sheets of unusual thinness and very smooth and transparent can be produced. The glass may be rolled in various ways, such as between rollers, arranged so as to deposit the rolled sheet upon a plate, or by several pairs of rollers arranged so as to roll the plate thinner and thinner. Provision is also made by the inventor to keep the fibrous materials moist during the rolling by having hollow spaces in the plates and rollers with perforations extending to the surfaces, by which water can be supplied from within.

Electrical Notes.

The United States navy will equip a tugboat with an electric light plant which will enable the boat to light vessels which may be out of commission or that may be undergoing repairs.

The street railway companies of Great Britain are using on roads now in operation, and have ordered for roads which are being constructed, between 2,500 and 3,000 electric motors, and according to a street railway journal, nearly or quite 20,000 horse power of American electric railway generators.

Electricity will play an important part in the coming Dewey celebration. The City Halls in Manhattan and Brooklyn will be brilliantly illuminated as will also be Grant's Tomb, and the Brooklyn Bridge will display magnificent lamps so as to show the words "Welcome Dewey." The letters will be 36 feet long and they will extend for 300 feet.

High voltage incandescent lamps are not used to any very large extent, but, according to Electricity, there is an installation of a 250-volt system at a small town in Italy called Arenzano. The installation is on the three-wire direct current system. The power is derived from a water power a mile and a half distant, and current comes without transformation. The work is said to be very successful.

Prof. Blake, of the University of Kansas City, Kansas, who has lately been studying the effect of electrolysis upon water mains and gas pipes, states that there are some places in that city where an incandescent lamp can be lighted by simply attaching it to a fire hydrant. Some of the water pipes taken up seemed ready to go to pieces, and in some of the pipes it was possible to penetrate the metal with the blade of a knife.

The Electrical Congress will be held at Paris during the Exposition, and will begin August 18, 1900. The work is divided into the following classes: 1. Scientific methods and instruments of measurement. 2. Production of electric energy; transformers; transfer and distribution; electric lighting; traction. 3. Electro-chemistry; electro-metallurgy; accumulators; electric furnaces. 4. Telegraphy; telephones and various applications. 5. Electro-physiology.

A water fall on the Platte River west of Fremont, Nebraska, will probably be utilized to transmit power to Omaha, thirty-five miles distant. The water fall is 130 feet high and is sufficient to operate a 25,000 horse power electric plant. It is proposed to make a canal having a grade of one foot per mile along the base of the ridge which runs parallel with the river for some distance. The construction of the canal and reservoir will entail an expense of about two million dollars.

Among the industries where electricity is particularly valuable is in hat manufacture. The power is required, not only to turn machinery, but to heat tools that must be used for finishing. The Western Electrician recently had an interesting article on the subject which showed a number of devices for the use of this industry, including electrically heated pressing machines for straw hats, electrically heated ironing machines, soft hat curling machines, internally heated flanging bag, etc.

The Navy Department has prepared plans for an extensive electrically-operated machine shop, to be erected at the New York navy yard. The current consists of three 400-kilowatt directly-connected two-phase generators supplying current at a pressure of 220 volts. A complete system of motor-driven machinery will be installed, and every machine tool requiring more than five horse power will require an independent motor connection. Thirteen electric cranes will be installed in various parts of the shop.

Some interesting experiments in wireless telegraphy have recently been carried on between the Blue Hill Observatory and the Harvard Memorial Tower in Cambridge, Mass., the distance being about twelve miles. The results have been encouraging, although there is considerable disturbance, owing to the many electrical influences in the vicinity. Special attention is being devoted to the elimination of these disturbing factors. The experiments are being carried on under the direction of Prof. A. L. Rotch. The apparatus at the Blue Hill Observatory is attached to a kite.

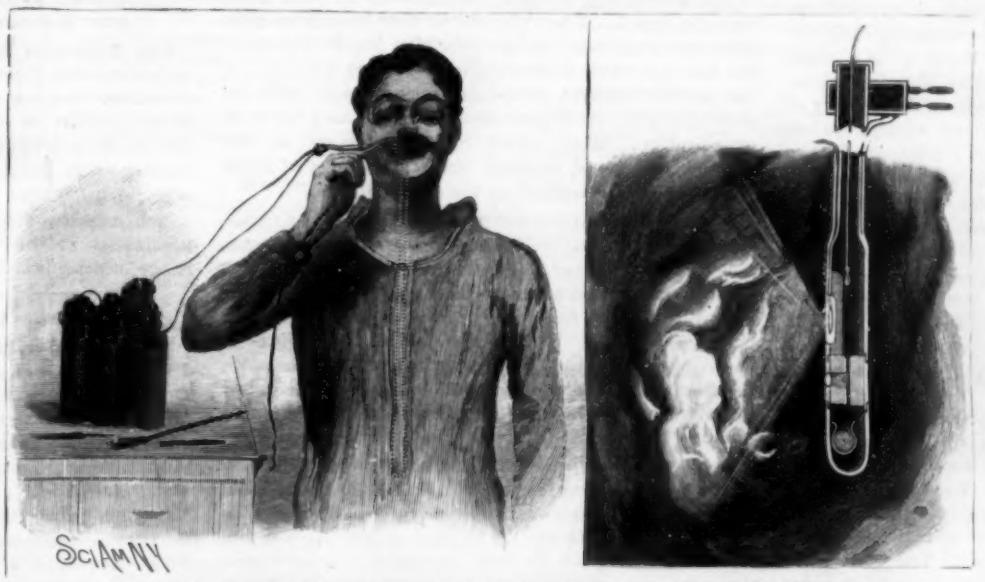
G. Hellmann points out in Terrestrial Magnetism that after Columbus discovered the variation of the magnetic declination in 1492, the belief gained ground among mariners that the longitude could be immediately determined from the variation; but Mr. Hellmann points out that the variation remained unknown, outside nautical circles, until it was independently discovered in connection with the use of the compass for portable sun dials. It was Georg Hartmann, a mathematical instrument maker at Nuremberg, who discovered the magnetic variation on land and found it to be only six degrees east at Rome in 1510. For nearly one hundred years after this discovery most of the writers on magnetism and dials omitted all mention of the declination and assumed that the needle pointed true to the polar star. By sighting along the needle to the polar star, the variation was measured.

PHOTOGRAPHY OF THE STOMACH.

Dr. Max Einhorn, of New York city, made a communication to a medical journal some seven years ago regarding "gastrodiaphany," in which a miniature Edison lamp in a special mounting attached to a soft rubber tube containing a wire was introduced into the stomach so that an examination can be made of it. This method was called "gastrodiaphany," as the stomach became translucent. The object of this device was to show the size and situation of the stomach to the eye and also to recognize tumors or other gross anatomical changes of the anterior wall of the stomach. This was, of course, a different apparatus than the "polyscope," which is used for looking into the stomach, and was not intended to replace any such device. It has been found to be of considerable value to surgeons.

In the same paper Dr. Einhorn described a camera for photographing the interior of the stomach, but owing to technical difficulties, the camera was not constructed by Dr. Einhorn. Such a camera has, however, been perfected by Dr. Fritz Lange, of Munich, Germany, on almost the identical lines given by Dr. Einhorn.

Through the courtesy of Dr. Lange we are enabled to present an accurate illustration of the device employed. The camera is a marvel of compactness, and is constructed on exactly the same principles as all cameras for taking moving photographs, although, of course, there is no attempt made to combine them so as to project the actual operations of the stomach. The camera itself is swallowed by the patient, and it contains a small electric lamp for illuminating the walls of the stomach. A photographic film twenty inches long and a quarter of an inch wide is wound at the bottom of the camera. One end of the film is fastened to the cord, which runs freely in the tube. When the cord is pulled, the film is drawn slowly past the lens. The cord and the conducting wires must, of course, be swallowed with the camera itself. When the camera reaches the bottom of the stomach the surgeon begins to pull the cord, which runs the film past the lens. The electric light is then turned on, and, after the sensitive film has been impressed with the image, the current is turned off and another section of film is brought into play until the requisité number of pictures have been obtained, then the entire apparatus is withdrawn from the stomach of the patient and the films are carefully developed and enlarged.



DR. LANGE'S APPARATUS FOR PHOTOGRAPHING THE STOMACH.

A NOVEL ELECTRICAL EFFECT.

Mr. George W. Patterson, of Chicago, has favored us with a photograph of an "electrical spectacular effect," which he produces at entertainments which he gives. The graceful figures of light shown in our engraving are produced by electrically lighted Indian clubs swung in a darkened room. The club is of special construction and the current is supplied by flexible wires inclosed in a rubber tube. Three series of eight, three, and one-candle power colored lamps are set in sockets in the club at right angles to the center of the club, which is split lengthwise. At the tip of the club is a 32-candle power lamp. When the clubs are swung at ordinary speeds the effect is very beautiful, an operator behind the scenes manipulating a switchboard turning on and off the lights in the two clubs, which are swung to music. The patterns are almost infinite in their variety and suggest the engine-turning on our bank bills. Storage batteries furnish the current when the regular incandescent circuit cannot be tapped.

EFFECTS OBTAINED WITH INDIAN CLUBS MOUNTED WITH ELECTRIC LAMPS.

Production of Fluorine by the Electrolytic Method.

M. Moissan has lately presented to the Académie des Sciences a description of his new apparatus for the preparation of fluorine by the electrolytic method. Up to this time platinum vessels and electrodes have been used for this purpose, but as they are attacked during the operation, the preparation of fluorine by this method involves a considerable expense. M. Moissan has for some time been carrying out a series of experiments with this element, and has recently designed a new electrolytic apparatus in which the containing vessel is of copper, its form being about the same as that of the platinum vessels. Its volume is somewhat greater, being 300 c. c., thus permitting him to use about 200 c. c. of hydrofluoric acid, whose conductivity is increased by the addition of 60 grammes of acid fluoride of potassium. The electrodes are of platinum, as before, but have a larger surface; they are made in the form of hollow cylinders open on one side.

The mixture of hydrofluoric acid and fluoride having been carefully freed from water, the electrolysis is carried on very satisfactorily in this apparatus, and the containing vessel is not attacked. It is probable that the fluorine which comes off, being in solution in the liquid, attacks the copper to a slight extent at first, and forms upon the surface of the vessel a thin coating of fluoride of copper, which serves to protect it from further action. This explanation is borne out by the fact that when copper electrodes are used, the formation of a layer of fluoride is observed upon the anode plates; this layer acts as an insulator and prevents the current from passing.

The amount of fluorine produced by this apparatus is large enough to give good results; for instance, by using a current of 15 amperes at 50 volts, M. Moissan has obtained a rate of production corresponding to 5 liters per hour, the experiment lasting six minutes. In a second experiment he employed a current of 20 amperes at the same voltage, and the production reached the rate of 8 liters per hour. However, this second experiment cannot be carried on for any length of time, as the liquid heats excessively, in spite of the fact that the apparatus was cooled to as low as —50° C. The fluorine given off in this latter case carries along with it a large quantity of the vapor of hydrofluoric acid.

M. Moissan considers this apparatus a decided improvement upon those which have existed heretofore, and has been using it in the experiments which he has been making recently in his laboratory; he also expects to use it to advantage in a series of new experiments, in which it will be necessary to have a constant stream of fluorine.

The Origin of the Decimal System.

The decimal system, it has been said, was evolved from the human hands, which, with their ten fingers, constituted the only counting-board used by primitive man. It is well known that the system was not perfected until ciphers were introduced. This cipher system was invented in India in the fifth century, and its introduction into Europe is generally credited to Leonardo Fibronacci, better known as Leonardo Pisano, the author of *Liber abaci*, published in 1202. Leonardo learned the Arabian tongue and art of reckoning from his father, who lived in the Arabic city of Bugia. But before Pisano's time, another *Liber abaci* had been written by Gerbert (translated in 1843 by the French academician Chasles), which is based on a cipher system. At the last Toulouse congress, R. Astier showed that the same system had already been employed in the *Geometria* of Boethius (sixth century), and hence long before the introduction of Arabic signs into Europe.

Astier states that the counting-board (abacus) of the Greeks and Romans, which serves as the basis of column reckoning, was invented by the Babylonians, who, it will be remembered, are usually thought to have used only the duodecimal system. Astier supports his assertion by citing an old abacus which seems to have escaped the attention of such mathematical historians as Chasles, Montucla, Marie, Bossut, as well as the old lexicographers Rich and Saglio. The precious document in which the abacus is described has been preserved by a Renaissance scholar, Bolsani (Pierius Valerianus), in his work, *De sacris Aegyptiorium litteris*. The system which he describes contains nine numbers, running from one to nine, a cipher, or zero, being dispensed with by using a special column and a decimal arrangement of figures progressing from left to right. The numerical characters of this abacus of Bolsani's are in every way similar to the cuneiform letters of the Chaldeans and entirely different from Arabic numbers. Bolsani's abacus would therefore lead us back to Babylonian days; and the period or comma which plays so important a part in the decimal system is really a cuneiform character.

Astier has requested Assyriologists carefully to examine the statue of a builder in the Louvre, usually designated as the statue of King Gudea (2500 B. C.) It is generally supposed that Gudea is here represented as a builder holding in his hands rule and compass and on his knees a rectangular tablet on which the scale of Babylonian measurements of length are inscribed, together with a figure which has hitherto been considered the plan of a building. Astier holds that this scale is perhaps a Babylonian abacus, and King Gudea is represented as the inventor of the decimal system. So bold an hypothesis can be accepted only after a most searching investigation on the part of Assyriologists.—Prometheus.

Absorption of Nitrogen.

It is pointed out in Nature that, in connection with the preparation of argon, while Prof. Ramsay used magnesium for the absorption of nitrogen, Ouvrard subsequently proposed lithium and Maquenne recommended a mixture of lime and magnesium. Dr. Hempel, however, has investigated the subject systematically and finds that a mixture of calcium and sodium is much more effective. He mixes 1 gramme of finely divided magnesium with 5 grammes of coarsely powdered lime and 0·25 gramme of sodium. In a comparative time experiment the rates of absorption of nitrogen by magnesium, lithium, lime-magnesium, and lime-magnesium sodium were in the ratio 1, 5, 8, and 20.

A RUSSIAN expedition will visit the New Siberian Islands next spring. The Czar will assist the expedition.

Correspondence.

The Proposed United States Cruisers.

To the Editor of the SCIENTIFIC AMERICAN:

In your issue of August 19, I notice an article referring to the projected second class cruisers for the United States navy, and as I take the keenest interest in your navy as well as that of my own country, permit me to make a few suggestions.

I must say in looking over the particulars regarding these projected vessels, that I fully agree with the comments on the same; for to build the vessels as projected would be to build a vessel of as obsolete a type as H. M. S. "Mercury" in the British navy, built in 1878, twenty-one years ago, with the exception that the battery would be modern. The "Mercury" is a vessel of 3,730 tons displacement, 16·8 knots speed, coal capacity of 780 tons, no protective deck, and a battery of thirteen 5-inch slow-firers and fifteen smaller quick-firers and four torpedo tubes. Now I must say I have always admired the skill of United States designers in designing the vessels of the navy, for they have always turned out vessels in a good many points second to none in any navy; but in these proposed designs, it looks like a going back in naval architecture for twenty years. In your article you have prepared tables of comparison of several ships. Now, of course there are a great many points to be looked at, apart from the requirements, viz.: Speed, coal endurance, gun power, and defensive powers. There is the point to be considered, for what particular service they are intended. Now, as they are to be sheathed and coppered, I presume they are mostly for foreign service. Other points to be considered are structural strength and freeboard (features of the utmost importance in relation to seaworthiness); also the quantities of ammunition and stores to be carried. The latter are points to be taken into consideration in making comparisons; and as these do not appear in tables of comparison, it is difficult if not impossible to fairly compare one ship with another. Of course, another point mentioned by you is the accommodation for officers and crew.

Before going any further, I want to say I am pleased to see the cudgels taken up in behalf of the United States steamship "New Orleans." I have had the pleasure of seeing her when on her way in company with the "San Francisco" from Elswick to New York, as they touched at this port, and I must say she was a fine ship in every particular; the only objection I had to her was that her freeboard was a little low and she was in all probability a wet ship in a seaway.

To return to the subject of new cruisers. I notice by the dimensions given that they will have a fairly wide beam for their length; of course, more length and less beam would mean, generally speaking, finer lines, and that would be more favorable for higher speed. On the other hand, the shorter and fuller hull would probably be more favorable in contending with severe weather and a heavy sea.

W. R. SHUTE.

Halifax, Nova Scotia.

Automobile News.

Prizes were offered last November in Paris for a feeding pillar to supply energy to electric automobiles. A number of devices were submitted, and in some cases arrangements were made for prepayment for the energy supplied. The pillars were found to be too expensive, so the prize was divided among two competitors, and the judges are of the opinion that there is still room for further improvements.

The automobile industry appears to be on a good financial basis. When the bicycle first became so popular, men went into the business with insufficient capital, and the result is that the failures were legion. The automobile business, on the contrary, appears to be approached with better provision of capital and business organization. Many other industries, such as tire makers, makers of bearings and furnishings of steel, will be greatly benefited by the new industry.

The Horseless Age recently published a little wrinkle which will be valuable for owners of motor carriages. It consists of a meter to determine the grades and can be made by almost anyone. It consists of a pointer or pendulum which follows a graduated arc divided off into degree marks. This is fastened to the carriage at any convenient place, preferably where it can be seen. As the carriage ascends the grade, the pointer, actuated by gravity, will indicate the steepness of the grade which is being ascended.

There are now over 7,000 owners of automobiles in Europe, and the number of vehicles is, perhaps, 10,000, and of this number, says the Annuaire Générale de l'Automobile, there are no fewer than 5,606 in France. Out of this number no less than 4,541 are scattered through the departments. There are 619 manufacturers in France, not including the makers of parts, 998 dealers in them, 1,095 repair shops, 3,939 stores for oil, gas, etc., and 265 electrical charging plants and charging "posts." The figures seem very high. We doubt very much if there are 619 regular manufacturers of automobiles, although there may be 619 firms that have made one or more automobiles. Making one carriage, however, does not constitute a factory in the ordinary sense of the word. For the remainder of Europe the figures are not very complete. There are 368 owners of automobiles in Germany, 90 in Austro-Hungary, 90 in Belgium, 44 in Spain, 304 in Great Britain, 111 in Italy, 68 in Holland, 114 in Switzerland. It is impossible to state at the present time how many automobiles are in this country. It is estimated that the number of them is 500. The Electrical World, however, considers these figures too high, and we think that 300 or 350 would be nearer the figure. A large number of concerns are preparing to turn out carriages of all kinds in large quantities, and within two years we can number our carriages by the thousand.

Curious Graving Dock.

The new graving dock opened recently at the Union Docks, Limehouse, London, is peculiarly interesting from the fact that in order to construct it the buried hulk of an old East Indiaman, called the "Canton," had to be excavated and cleared away. In 1818, when Mr. Henry Fletcher was making arrangements for the building of the docks on their present site, he purchased the old East Indiaman, sunk her, erected gates at her stern, and made a unique dry dock which, until 1898, formed the third or lower dry dock.

The Building Edition for September.

The September Building Edition is, as usual, filled with handsome illustrations of the most modern types of houses. Among its attractive features are Joaquin Miller's cabin at Meridan, Washington, D. C., the Schloss-Neuschwanstein in Bavaria, and Old Colonial Doorways in Bond Street. The last belongs to a series of important measured drawings of old houses which are steadily vanishing. The modern houses illustrated in this number are numerous and their range in price is considerable.

The Current Supplement.

The current SUPPLEMENT, No. 1236, is an unusually attractive number. "The Growth of the Mind" is by Dr. James Weir, Jr., and is an interesting article giving the observations of a naturalist on the development of a bird's mind. "The Destruction of the Exhibition Buildings at Como" illustrates the fierce fire which destroyed famous scientific relics of Volta and Galvani. "The Relations of Physics and Astronomy to the Development of the Mechanic Arts" is by Prof. Cleveland Abbe. "In Kaiser Wilhelmland" is an article describing the manners and customs in the German colony of New Guinea; it is accompanied by sixteen illustrations. "The Discovery of the Agora at Corinth" is by Prof. Rufus B. Richardson. "South American Trade" admirably supplements the Consular Notes. "Artificial Foods; Why These Exist and What They Are" is by Prof. Remington.

Contents.

(Illustrated articles are marked with an asterisk.)

RECENTLY PATENTED INVENTIONS.

Agricultural Implements.

GRAIN-DAMPENER.—WILLIAM J. EN EARL, Denver, Colo. This invention seeks to provide a mechanism for dampening grain or similar material, which mechanism shall automatically control the supply of water, so that the grain will be uniformly dampened. This result is obtained by the use of a valve with controlling means operative by variations in the flow of material. These means comprise a hopper having a vertical, longitudinally-extending discharge-slot operative as an outlet to an extent proportioned to the volume of the material flowing through the hopper.

CORN-PLANTER ATTACHMENT.—PETER A. PETERSON, Lake Mills, Iowa. The attachment is adapted to be used on check-row planters for regulating the discharge of the seed. In the main, the attachment consists of a tappet-wheel secured to one of the running-wheels of the planter; a fixed bar, which is horizontally arranged, and which rigidly connects the axle of the running-wheels with the planter frame; a slidable bar arranged over and parallel with the fixed bar and serving to operate the seed-discharge valve in the seed box; a tappet-lever pivotally connected with the two bars; and a hand-lever provided with a bent lateral prong for engaging the tappet-lever and temporarily supporting it so that the attachment is held out of gear, and hence out of action.

SUGAR-CANE SCRAPER.—JOSEPH M. JUNCA and DENIS P. J. BURGUIERES, Louisa, La. According to the method of cane cultivation practiced in Louisiana, the ridge in which the cane is planted is first barred off on each side by a plow and then scraped by a hoe. The machine forming the subject of this invention avoids much of the labor incurred by this process. When drawn along the ridge, the machine, in its first operation, removes one side or edge, and when drawn back over the ridge removes the opposite edge. Thus the ridge is caused to present an obtuse angle in cross section. The scraper removes the compact, surplus soil, so that the cane becomes more readily affected by the heat of the sun and is caused to sprout quickly.

Mechanical Devices.

MECHANICAL MOVEMENT.—GUSTAV HALLBERG, Manhattan, New York city. The invention is an improvement in devices for changing reciprocating into rotary motion, and is composed of two segmentally-toothed wheels, mounted on a shaft and provided with stop-pins. The teeth of one wheel are arranged oppositely to the teeth of the other wheel. Reciprocating racks, provided with stop-lugs, are adapted to engage the wheels. When a rack has reached the end of its movement in one direction, its lug will engage the stop-pin on the corresponding wheel, thus preventing the wheels from being thrown too far forward and serving to move the rack into engagement by the impetus of the wheels.

MECHANICAL TOY.—SHERWOOD E. EDWARDS, Danville, Va. This toy is intended to represent a prize-fight, in which the pugilists are mechanically operated upon a stage, and made to imitate the movements of living men. The figures are held and operated upon a platform, without being actually attached thereto. The figures may be simultaneously or independently operated, or either figure or all the figures may be caused to fall.

BRICK-MACHINE.—JAMES GARRETT and JAMES H. WELCH, Monaca, Pa. On the under side of the framework of the machine, molds are arranged into which the material is pressed by a plunger. A receiving table is mounted to yield upward when the filled molds are pushed from the machine, and is provided with a cut-off device for striking off the surface material from the filled molds and delivering the material upon the table. A reciprocating sweep operates over the table and is actuated in unison with the plunger.

GLASS BLOWING MACHINE.—LAWRENCE H. DOLAN, Pendleton, Ind. The machine is provided with a number of two-part molds which are spring actuated to hold them open normally. The molds are radially supported on a shaft which can be turned so as successively to dispose one mold uppermost. A mold-closing device is provided, which is controlled by a lever directly connected with and locked by a rack and pawl when the uppermost mold is closed. An air-supply pipe is provided, one end of which is engaged by a blow-pipe, while the lowermost end is connected with the closed section of the mold. It is found that four machines may be easily operated by two persons.

LOOM.—JOHN H. SMALLWOOD, Paterson, N. J. This loom is especially designed for weaving plaits integrally with the body-fabric. The loom is provided with a cloth-beam mounted to rotate loosely on a shaft. A take-up mechanism is connected with the shaft to rotate the latter intermittently. On the cloth-beam is a head provided with oppositely-arranged ratchet-wheels. A wheel is mounted to turn with and to slide on the driven shaft and has ratchet-wheels meshing with the head ratchet-wheels to turn the cloth-beam in both directions. For the slidable wheel a shifting lever is provided connected with a three-armed lever operated by a pair of treadles. A revoluble disk carries tappets for actuating the treadles.

Railway Appliances.

BALL-BEARING CAR-AXLE BOX.—JOHN W. BREEDING, Bisbee, Arizona Territory. This invention provides an improvement in car-axle ball-bearing boxes which can be cheaply made, readily adapted to any style of outside box, and will greatly reduce friction. The end guard-plates form bearings for the shoulders on the axle and operate to retain the balls in the undercut grooves in which the balls are fitted.

CAR-WHEEL.—JOHN W. BREEDING, Bisbee, Arizona Territory. The object of the present invention is to provide an improved construction by which to prevent the wheel from climbing the track-rail. The car-wheel has a tread and a flange and is provided with balls supported in the flange. The balls protrude from the inner face of the flange and are adapted to turn in a direction radial to the wheel in order to avoid any lifting movement of the wheel-flange alongside the track rail.

LOCOMOTIVE-CAB PLATFORM.—JAMES F. DUNN, Salt Lake City, Utah. This invention seeks to provide a platform which will serve to protect the engineer and fireman from the danger resulting from the breaking of the side-rods of the locomotive. This end is attained by constructing the cab-platform of metal, either rolled or cast, which has certain peculiarities of structure and arrangement that enable it to resist the blow of the fractured rods, thus saving from injury the fireman and engineer.

Electrical Apparatus.

ELECTRIC PUSH-BUTTON CUT-OUT.—JAMES I. GUNTHER, Borough of Manhattan, New York, N. Y. This push-button cut-out consists of a rotatable hard wood cylinder, near one end of which are mounted, on opposite sides, contact strips connected together around the end of the cylinder. Contact spring fingers fastened one to each half of the upper base piece of the button (which is bisected), are connected to the wires of the circuit and make it in one position of the cylinder, breaking it when the latter is moved a quarter turn. The cylinder has four wings attached to it at its other end, and the uppermost wing is engaged by a pusher-point in the bottom of the button, so that when the button is pressed, the wing is pushed downward. A suitable spring raises the button again. By this arrangement the circuit is alternately made and broken when the button is pressed.

ELECTRIC ALARM CLOCK.—JACOB GOLDENBERG, LION GUTTERMAN, Borough of Manhattan, and NICHOLAS KOUNOW, Borough of Brooklyn, New York, N. Y. This alarm clock has a battery arranged in the back of the casing. One pole of the battery is connected with the bell circuit by pressing a button, while the other pole, which is the containing case, is always against a contact spring. A contact point on the hour-hand shaft behind the dial, touches another contact point, which is set by turning a pointer on the dial face, and thus the circuit is made and the alarm bell rung.

Miscellaneous Inventions.

ACETYLENE GAS-GENERATING LAMP.—CHARLES KELLEY, Passaic, N. J. This lamp consists of a circular generator casing surrounded by a water jacket and having a hollow tube passing upward through its center almost its entire height. An outlet pipe for the gas passes from near the top of the casing down one of its sides and out through the water jacket. The carbid is placed in a holder which fits into the casing, and a wick passing through the central tube carries water to the carbid. A screw rod passes through the cover of the generator casing and terminates in a rubber plug. By turning the rod, the plug presses the wick firmly against the edge of the central pipe, thus stopping the flow of water and regulating the generation of gas. A parabolic reflector, with removable glass, is fastened to the outside wall of the water jacket and contains a suitable burner.

ACETYLENE GAS GENERATOR.—JOHN H. D. NORDEMAN, Washington, D. C. Attached to opposite sides of the tank in which the gasometer bell rises and falls, are slotted metal guides through the slots of which project the ends of a small rod that passes the bell near its top. Pivoted to one of these guides, near its top, is a similar guide, which bends out at an obtuse angle. When the bell descends and the pin strikes this angle, the bar is swung sideways, and a pawl on its end revolves a turn-table containing carbid cartridges a certain distance by engaging a ratchet tooth of a circular ring mounted on the turn-table. Each cartridge has a trap door in its bottom, which opens and precipitates the carbid into a funnel. Directly under the mouth of the funnel is a cone which spreads the carbid to the sides of the generator. A layer of oil on the water rises above the mouth of the funnel and extends downward to a point on the cone where it is the width of the funnel mouth, thus forming a seal which keeps the gas from rising into the funnel.

GASOLENE BURNER OR TORCH.—ERNEST C. DICKERSON, San Antonio, Texas. This burner consists of a vaporizing chamber, one end of which is conical and the other fitted with a plug having a small hole to correspond with a hole in the end when turned in the proper position. This hole is opened when an exceedingly intense flame is desired. The chamber is filled with

gravel, tacks, or the like, to break up the liquid. It is covered by a frusto-conical tube at the smaller end of which, and in line with the pointed end of the chamber, is a needle valve connected by a pipe with the top of the chamber. Another pipe connects the bottom of the chamber with the bottom of a cylindrical gasoline holder, and there is a valve near the latter. A short tube projects from the top of the tank and terminates in a bulb for forcing air into it. The gasoline is first forced through the needle valve and fills a small cup below the latter. The cupful is ignited, and, in burning, heats the vaporizer, which then produces vapor. The burning vapor passing between the vaporizer and sheath, draws in air to aid the combustion.

SHOOTING GALLERY.—CHARLES B. JEFFERS, Logansport, Ind. The target consists of a framework on which are mounted a number of endless chains carrying figures of animals, so constructed that when hit by a bullet, the smaller ones will fall over and the larger ones will signify the fact by dropping the head or in some similar way. A round target on each side has a hole in the center through which a bullet can pass and ring a bell. The bullet causes a lever to put in gear a mechanical piano, and cause it to play. The target and piano are connected with a shaft driven by a gas engine or other motive power.

HEAD-GATE LOCKING DEVICE.—BENJAMIN F. POWELL, Manzanola, Col. This locking device has for its object the limitation of the distance the gate can be raised. A threaded rod having a keyway running along it passes through the cross-bar of the framework and is raised by screwing down a nut above the cross-bar. A collar split at one side and having a pin across the split is locked in place by a padlock, the bar of which passes around the pin and in the keyway; and this collar limits the upward movement of the rod and gate.

GAME APPARATUS.—CHARLES E. PATTERSON, Hornelsville, N. Y. This game is a number game played with small square checkers, each one of which has a number stamped near each of its four corners. The board is divided into four squares by double lines the width apart of the checkers and divided by transverse lines into squares the size of the checkers. The game consists in choosing some number and placing a checker on one of the squares. The player scores as many points as he can make multiples of the number chosen by adding together the numbers on one side of his checker and his opponent's checkers. The game is completed when all the squares are filled.

TRUSS.—ZEBULON OLIVER, Tesla, Texas. This truss pad is made of beeswax fastened to a wood backing. It is a round button with an annular channel around the center, from which, upon passing the pad to the body, a sufficient amount of air will be exhausted to hold the pad sufficiently tight to prevent its slipping. The pad is adjustably mounted on a U-shaped spring which passes around one side of the body and carries two adjustable pads on its other end.

WINDLASS.—GEORGE W. MORGAN, Dawson, Canada. The crank is so connected with the drum that if the windlass suddenly revolve backward, the crank is released from the drum. This is accomplished by attaching a boss with sloping teeth to the shaft and providing the hub of the crank arm with similar teeth to turn the windlass. Outside the crank and like it loose on the shaft is a wheel with two set-screws. The outer end of the crank-hub has several long sloping teeth and when the set-screws are tightened against the outermost end of these, the crank hub is clutched to the shaft. If the windlass suddenly start backward, the inertia of the wheel causes it to lag behind, and the set-screws will slide to the inner end of the teeth, whereupon the spring will separate the crank-hub from the boss. The windlass is also furnished with a band-brake and a pawl and ratchet to keep it from unwinding.

HOLDER FOR PENCILS.—ADOLF KLEIN, Manhattan, New York city. This holder consists of a nut with screw thread to be fitted in the back of a note or memoranda-book at the top end. The pencil is provided with a cap having a screw thread to fit the nut and a shoulder to prevent the pencil from screwing in too far.

SUSPENDERS AND WAIST-HOLDER.—MINNA JANSEN, Astoria, Queens, New York city. The invention consists of a belt of fabric the ends of which are buckled together in front. The belt is provided with ordinary suspenders, the back ends of which are sewed to the upper edge of the belt and project a short distance below it, forming tabs adapted to project through holes in the waistband of a shirt-waist and thus keep it in place. On the back of each tab is a hook which engages an eye on the skirt band after the tab has been inserted in the shirt-waist band. The latter is therefore securely held in place. Suitable straps depend from the belt for supporting hose and holding up the dress-skirt in wet weather.

AWNING-FIXTURE.—JAMES SULLIVAN, Manhattan, New York city. This fixture is a pear-shaped plate with a narrow slot near the neck end and a hole containing a round metal ring in the body part. The neck part is bent at an obtuse angle and the swivel eye in the top of the awning pulley block is passed through the slot. The rope passes through the hole in the shield thus formed and thence over the pulley; while the metal plate furnishes a smooth surface for the awning to fold upon and effectually protects it from catching in the pulley.

SUSPENSION-CABLEWAY AND ROPE CARRIER.—GUSTAF P. WERN, Manhattan, New York city. The invention provides a series of support brackets travelling on the main cable and constructed to carry on small wheels a carriage or traversing rope and a hoisting rope between the carriage and the towers. The brackets are properly distributed by means of a two-stranded rope attached to the carriage and carrying clamps of several sizes at the proper distances apart. These clamps pass between two small wheels on each bracket but the one they are intended to move, and each moves one bracket to its position on the line.

HAMMOCK SUPPORT.—HOMER R. WOOD and GEORGE R TAITT, Prescott, Arizona. The support consists of two tripods, the legs of which are fastened together at their top ends by a pin which passes through clevises, one pointing downward and the other upward, adapted to support a hammock and awning. The tripods are connected by a rod in two telescoping sections, so that it occupies but little space when not in use.

EGG-BEATER.—THOMAS HOLT, Tarrytown, N. Y. This beater is an improvement of the usual form in which two rotating beater-bows are arranged side by side on different axes eccentric to each other, so that they rotate one within the other. The improvement consists in so twisting the circular parts of the beater arms that they will in describing a circle be always at an angle to the circumference and thus tend to throw the material inward so as to beat it thoroughly. The upper shank part of the arms is curved to conform with the circle it describes so that it passes edgewise through the material with the least possible friction.

HAME-FASTENER.—FRANK N. RANKIN, Gainesville, Texas. The fastener consists of a flat plate with two ears extending upward from the sides at one end and containing three transverse slots at the other. This latter end is bent downward and under, so that one slot is just under the actual end of the plate. A cam locking-lever is pivotally supported in small holes in the tops of the ears. The fastener will securely hold the hame-strap to the loop or eye on the hame-frame when the hames are unfastened and not in use, and yet will allow it to be readily detached from the eye when desired.

Designs.

WHEEL-SPOKE.—CLARENCE E. SPICER, Titusville, Pa. The body of the spoke is threaded at its inner end, the thread terminating in an hexagonal nut a short distance from the end of the spoke. From here the spoke tapers to its outer end, where it is provided with flattened prongs or tines forming a U.

NOTE.—Copies of any of these patents will be furnished by MUNN & CO. for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

NEW BOOKS, ETC.

VON LOEBELL'S JAHRESBERICHTE UEBER DIE VERÄNDERUNGEN UND FORTSCHRITTE IN MILITÄRWESEN. XXV. Jahrgang. Zweiter Theil. Berichte über die einzelnen Zweige der Kriegswissenschaften und des Heerwesens. Berlin: Ernst S. Mittler und Sohn. 1899. Large octavo. Price, paper $3.30.

The second volume of the jubilee number of von Loebell's Jahresberichte is devoted entirely to the progress made by the various countries in the past twenty-five years in the various branches of military science. Our own recent war has not been neglected; and the way in which it was fought, the lessons which it taught, and the results obtained, have in various articles been discussed with a most gratifying impartiality. The two volumes of the Jahresberichte will be made the basis of all future v. Loebell reports.

THE INTERNAL WIRING OF BUILDINGS. By H. M. Leaf, Westminster, England. Philadelphia: J. B. Lippincott Company. 1899. 16mo. Pp. 198. Price $1.50.

Electric energy is now so universally adopted for lighting, heating, and transmission of power and other purposes, that insulated wires or cables for conveying the current are now fixed in most buildings of any importance. The conditions under which these conductors have to perform their work in carrying the current vary greatly. It is the object of the treatise before us to describe the various means of fixing the wires to suit the different conditions under which the current is likely to be employed. English practice is, of course, described, but the book is certainly likely to prove useful to American electricians.

LEXIKON DER METALL-TECHNIK. Redigirt von Dr. Josef Bersch. Vienna: A. Hartleben. 1899. 2d, 3d, 4th and 5th parts. Price 30 cents each.

DIE MODERNE CHEMIE. Eine Schilderung der Chemischen Grossindustrie. Von Dr. Wilhelm Bersch. Vienna: A. Hartleben. 1899. 2d, 3d, 4th and 5th parts. Price 30 cents each.

When the first parts of these two works were published, we gave a brief description of them in these columns. The later installments, it must be confessed, have not deviated from the general excellence of the first parts, and the promises made have been fully kept.

PRACTICAL COURSE IN MECHANICAL DRAWING. By William Fox, M.E., and Charles W. Thomas, M.E. New York: D. Van Nostrand Company. 1899. 16mo. Pp. 98. 87 illustrations. Price $1.25.

Manuals and text books of mechanical drawing are legion, but the little book before us is a substantial addition to the literature on the subject. We particularly commend the half-tone illustrations, taken from life, showing the actual position which a draughtsman should use in drawing lines, etc. This is a feature which we have never seen in any other book, and it cannot but prove of great assistance to the beginner. The examples for practice are numerous and well executed, although some of them are reproduced on too small a scale; doubtless this cannot be avoided in a book that is sold at such a remarkably low price.

FIGHTING IN THE PHILIPPINES. Authentic Original Photographs. Chicago and New York: F. Tennyson Neely. 1899. Price 25 cents.

This is the most complete picture book of the Philippine Islands that we have seen. The photographs are well selected and are well executed. Their size is 4×7, which is plenty large enough to show detail. Actual scenes of the war including the fighting are given. The photographs show more conclusively than any that we have ever seen that war at best is a great horror. Some of the illustrations of the dead men are fairly sickening. This is practically the first war where the camera has played a really important part. The collection of pictures is unique and we do not know of any one who would not care to have this pretty little book.

MODERN PHOTOGRAPHY IN THEORY AND PRACTICE. By Henry G. Abbott. Chicago: George K. Hazlitt & Company. 1898. Pp. 234. 12mo. Photographs. Price $1.

This volume has been printed for the benefit of amateur photographers. The preface aptly remarks that there are two kinds of amateurs, one who presses the button and leaves the professional to do the rest, and the other, the earnest student, who has ambition to become in every sense of the word a photographer. The volume before us was certainly compiled for the latter individual. It is filled with practical information regarding cameras, plates, fitting up a dark room, exposure, etc., and the number of formulas published is large. A number of photographs are inserted which add considerable to the interest of the book. Excellent engravings of lighting and electric light decorations taken at night are given.

DIE ÆTHERISCHEN OELE. Von E. Gildmeister und Fr. Hoffmann. Berlin: Julius Springer. 1899. Pp. 919. Large octavo.

The need of a work which would discuss exhaustively and critically the entire field of etherial oils induced the well-known Leipsic firm of Schimmel & Company to commission Drs. Gildmeister and Hoffmann to prepare a book which would meet all requirements. To assist them in their labors, the firm placed at their disposal the data collected during the long period of its business career. The result has been a work which for scholarly and exhaustive treatment leaves nothing to be desired. Particularly valuable are the descriptions of commercially important oils, and the methods by which imitations and adulterated oils can be distinguished from the pure product. The work although inspired by Schimmel & Company is not to be considered as a trade publication, but as a scientific treatise which fills a long-felt want.

LIVING PICTURES. THEIR HISTORY, PHOTO PRODUCTION AND PRACTICAL WORKING. By Henry V. Hopwood. London: The Optician and Photographic Press Review. 1899. Pp. 275. 12mo.

A really satisfactory and adequate book upon moving pictures and moving picture photography has been needed for a long time, and Mr. Hopwood has succeeded admirably in his task. The devices are well illustrated and are marvels of ingenuity. Many of the diagrams are clear and helpful. We think that the author might have been more free in giving credit to the papers from which illustrations were obtained. We notice five illustrations from the SCIENTIFIC AMERICAN that, so far as we can see, no acknowledgment is given for their use. There is a bibliography of 145 titles.

DAS PERPETUUM MOBILE. Von A. Daul. Vienna: A. Hartleben. Pp. 133. With 33 illustrations. Price, paper, 60 cents.

Although like the alchemist of old the inventor of perpetual motion machines has labored to no purpose, his efforts are not without a certain interest to the modern mechanic. For this reason the author of the present work has collected from the principal scientific periodicals published in France, England, and the United States, accounts of the most notable perpetual motion machines. We observe that the SCIENTIFIC AMERICAN has provided Herr Daul with no small amount of material.

GEOLOGICAL SURVEY OF NEW JERSEY. Annual Report of the State Geologist for the Year 1898. Trenton, N. J. 1899. Pp. 344, plates and maps.

The geological survey of the State of New Jersey has been noted for many years as being a model State geological survey and its reports and maps are most creditable. The present volume does not fall below its predecessors in interest. Special attention is given to the pine belt and forest fires. The book is freely illustrated with half-tone engravings and diagrams.

DESCRIPCION Y MOVIMIENTO COMERCIAL DEL PUERTO DE BUENOS AIRES EN EL ANO 1897. Por Enrique Carmona. Buenos Aires: Imprenta de Juan a Alsina. Calle Mexico, 1422. 1898. Pp. 98.

INDEX TO THE LITERATURE OF THALLIUM. 1861–1896. By Martha Doan. Forms part of Smithsonian Miscellaneous Collections. Vol. XLI. Washington: Smithsonian Institution. 1899. Pp. 26. 8vo.

We have received the last edition of the catalogue of stereopticon apparatus and lantern slides of T. H. McAllister, the optician, of 49 Nassau Street, New York city. As might be expected, the new catalogue deals with the latest forms of lanterns, including the Welsbach electric and acetylene burners. The collection of slides is unrivaled, and a large majority of them are unique. The negatives have been taken specially for lantern slide work. In purchasing slides, it must be remembered that the ordinary photograph does not always blend itself to the adequate lantern slide, but where points of view are selected with special reference for use as slides, the results are highly satisfactory. Mr. McAllister's views of Rome, for instance, occupy many pages in the catalogue, and were made especially by a staff artist. The possession of a lantern and a few hundred slides is a most enjoyable and economical method of entertaining friends.

We have received a number of the Acetylene Gas Journal. It is published at Buffalo, New York, and the cost is 50 cents per year. We like the appearance of the new paper very much. It is filled with information relative to the new industry and it is the official organ of the International Association. An acetylene gas installation may be put into houses by many who are unfamiliar with the proper way of doing this work, and even the average gas fitter is at fault when it comes to acetylene. For this reason the back numbers of the Journal are particularly valuable.

Business and Personal.

The charge for insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in the following week's issue.

Marine Iron Works. Chicago. Catalogue free.

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Inventions developed and perfected. Designing and machine work. Garvin Machine Co., 141 Varick St., N. Y.

Machinery for R.R. contractors, mines, and quarries, for hoisting, pumping, crushing, excavating, etc., new or 2d-hand. Write for list. Willis Shaw, Chicago.

The celebrated "Hornsby-Akroyd" Patent Safety Oil Engine is built by the De La Vergne Refrigerating Machine Company. Foot of East 138th Street, New York.

The best book for electricians and beginners in electricity is "Experimental Science," by Geo. M. Hopkins. By mail, $4. Munn & Co., publishers, 361 Broadway, N. Y.

Send for new and complete catalogue of Scientific and other Books for sale by Munn & Co., 361 Broadway, New York. Free on application.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and although we endeavor to reply to all either by letter or in this department, each must take his turn.
Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(7718) C. W. asks: Will you be so good as to name the best conductor for the electric current? A. The best conductor for the electric current, meaning by best that which offers the least resistance to the current, is silver. After silver come in order copper, gold, aluminum, zinc, platinum, iron, nickel, tin.

(7719) D. A. S. asks: Can you furnish me directions to recharge dry batteries? A. Dry cells may be recharged by sending a current through them in the opposite direction. They are not worth recharging, but are thrown away when they are run down.

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AND EACH BEARING THAT DATE

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